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ABSTRACT

When evaluating the effectiveness of beginning teachers, researchers are interested in defining those teacher behaviors which are related to student achievement in elementary school reading and mathematics. This review of the research literature addresses three issues: (1) definition of the variables which should receive the greatest emphasis in such research, (2) the advantages and disadvantages of the various alternatives in research design and methodology, and (3) the availability of instruments to measure these variables. A number of tables provide lists of variables in classroom research, including: stability of achievement ratings, student ability and background, textbook choice, number of instructional trials, teachers' cognitive ability, research emphasizing teacher-student interaction, learning tasks, classroom environment, teaching methods, teachers' affective behavior, and skills measured. Bibliographic references, observational coding systems, and a model of the teacher as decision maker are appended. (GDC)

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# VARIABLES, DESIGNS, AND INSTRUMENTS IN THE SEARCH FOR TEACHER EFFECTIVENESS

by
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October, 1975

# PREFACE

This is one of a series of reports by the Far West Laboratory for Educational Research and Development, concerned with the study of teacher effectiveness. Under contract to the California Commission for Teacher Preparation and Licensing, with funding provided by the National Institute of Education, the Laboratory is studying teachers in second and fifth grade classes in order to identify teacher behaviors and classroom qualities that are related to reading and mathematics achievement. This multi-year research effort is titled the Beginning Teacher Evaluation Study (BTES). The study addresses a major policy issue of the California Commission which is the agency charged with certifying the appropriateness of teacher training programs throughout the State. Simply put, the Commission wants information about what teacher behaviors are related to student outcomes. This information will then be used jointly by the Commission and the State institutions that it certifies in order to better insure that beginning teachers receive training in areas that have been empirically demonstrated to affect student learning.

In this report Dr. Joyce was asked to provide for the Laboratory a review of literature and to synthesize that review with his extensive experience as an observer of classroom processes and a trainer of teachers. This report was to provide directions for the Laboratory staff in developing instrumentation and designs for a large field study of teaching. This paper addresses the questions: "What variables should receive the greatest emphasis in the search for the effective teacher?" "What kinds of designs are available and what are their advantages and disadvantages?" and "What instruments are

available for the study of each variable and what new ones should be developed?"

The directions pointed to in this paper are already affecting the BTES design, but more questions are raised in this paper than can be answered in any one study. Although the paper and the many hours of accompanying seminars were primarily for BTES staff, other researchers engaged in the search for empirical relationships between classroom teaching and student learning will also find this paper useful in their work.

As in other documents of the Far West Laboratory, the views presented in this paper are not necessarily endorsed either by the California Commission for Teacher Preparation and Licensing or the National Institue of Education.

David C. Berliner
Principal Investigator
Beginning Teacher Evaluation Study
October, 1975

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Part 1

## GENERAL CONSIDERATIONS

The overall purpose of the Beginning Teacher Evaluation Study (BTES) is to identify teacher characteristics which are associated with pupil gain in reading and arithmetic. Besides being of general scientific interest, the characteristics should also be useful to the formulation of policy in teacher education and certification. That is, the characteristics which emerge should either be trainable competencies which can become part of teacher education programs or ones which can be feasibly measured in large populations and can be incorporated into the screening of teachers and teacher candidates.

If the study is to yield generalizations about teacher effectiveness, it must reach beyond previous investigations and generate new knowledge, for the results of past investigations have not yielded policy-amenable conclusions. The history of the study of teaching has, however, yielded a base of findings and methodologies solid enough that there are grounds for believing that fresh knowledge can be achieved through a carefully-directed effort. The history also provides us with a series of problems and issues which have to be squarely faced during the design stages.

## A Comparative Mode of Research

In the search for dimensions of effectiveness we are operating in a comparative mode. That is, we are not simply trying to learn what works in teaching, we are trying to learn what works better. We are comparing teachers, methods, materials, social climates, organizational styles, and settings in an effort to identify factors which significantly differentiate effective from ineffective teaching practices.

The comparative mode involves an attempt to identify and interpret differences in order to arrive at concepts or principles of effectiveness. It differs from an evaluative mode in which teachers, methods, etc., are evaluated in terms of a criterion level. In the evaluative mode ten teachers might all reach a criterion in teaching (i.e., their students might all master a set of concepts in a week-long science unit). If this happened, all would be judged effective. In the comparative mode it is the differences between the teachers that are studied in an effort to identify the more effective person and understand what makes him so.

The comparative mode is not without its problems. For example, it can bog down in attempts to explain marginal differences. (If most of the children of all ten teachers learned the concepts alluded to above, is it worthwhile to study the differences between the teachers?) There is no general answer to this dilemma, especially because a series of small differences may turn out to have a considerable effect. Just as it is said that in professional sports the winners succeed by being only inches better than their opponents, time and time again, the better teachers might be only slightly better than their peers in any one transaction, but the slight bits might add up to a picture of long-term effectiveness.

## The Centrality of Student Learning

Student learning is the anchor of the research program. The focus is on the discovery of dimensions of teaching which boost student learning in reading and arithmetic. Thus, whatever other considerations affect design, the dependent variables are student achievement of various types in arithmetic and reading during the second and fifth years of formal schooling. The independent variables studied should either be directly related to the specific dependent variables or have a clearly discernible indirect relationship to them. Experimental teaching units should be constructed around specific sets of objectives. Dimensions of teacher and learner behavior should be indexed by types of objectives. Tests should differentiate types of outcomes. Most important, student behavior should be studied carefully. Effectiveness should be sought in terms of the ability of teachers to induce students to engage in activities which result in learning. Though the exact relationships between teacher behavior, student behavior and student learning are unknown, chances are they are interdependent. Using only student achievement to determine effectiveness provides little or no information about these interrelationships and implies teaching has little to do with learning. Thus, the design should permit inferences to be made about relationships between teacher behavior, student behavior, and learning outcomes for a more complete understanding of the teaching/learning process.

## Stability of Effectiveness*

We also have to concern ourselves with the general issue of "stability of effectiveness." It has astonished laymen and researchers alike that teachers apparently do not consistently produce similar effects relative to one another. That is, the most (least) effective teachers in one year (or treatment) are not the most (least) effective in another. Correlations of "stability of effects" are usually low in three kinds of research (however, there are important exceptions which will be discussed below.)

First are studies using general measures of student learning. In 1970 Rosenshine[1] reviewed nine studies consisting of:

> "(a) long-term studies in which teachers taught the same material to different students, (b) short-term studies in which teachers taught the same material to different students, (c) short-term studies in which teachers taught different material to the same students, and (d) short-term studies in which teachers taught different material to different students. Positive and consistent correlations were obtained in both (a) and (b), but the size of the correlations and the percentage of significant results were highest in (b)."

He concluded at that time that "one cannot use the residual achievement gain scores in one year to predict the gain scores in a successive year with any confidence," but he pointed to a number of ways to improve designs.

Brophy[2] used an improved design to study consistency for teachers in grades two and three across subjects (reading and arithmetic) over a three-year period. In his investigation there was consistent across-subject

---

* This topic is also addressed at length in Shavelson, R. and Dempsey, N. Generalizability of measures of teacher effectiveness and teaching process. San Francisco: Far West Laboratory for Educational Research and Development, Beginning Teacher Evaluation Study, Technical Report 75-4-2, April, 1974.

stability. That is, reading and arithmetic gain scores were positively correlated, often significantly, and classes that learned more in one aspect of reading gained more in other aspects as well.

Across-years stability coefficients presented a curious and hard-to-interpret pattern. (See Table One.) Teachers in non-Title I Schools showed a consistent pattern of correlations, but teachers in Title I Schools did not. (Stability coefficients were higher for teachers in non-Title I Schools.)

While Brophy's results show more support for the concept of stability than most previous studies, his findings are mixed. Brophy used student gain scores to control for prior learning, but they do not control for ability to learn. If for some reason a teacher has several classes with students who have difficulty in learning, gain scores may be low regardless of her teaching skill. And conversely, teachers regularly assigned to high-potential learners might achieve higher gain scores <u>for that reason</u>. Brophy feels that practices such as "homogeneous" grouping would lower the within-class variability and reduce year-to-year correlations of gain scores, but it might easily have the opposite effect. Oddly, his experimental design has no provision for control of student characteristics. He does do careful work, however, and presents the most convincing evidence so far that teachers are consistently effective, at least under certain conditions. What those conditions are and how they contribute to the stability of teacher effectiveness are questions Brophy does not approach.

The second type of studies of stability of effectiveness are within-curriculum area investigations. The studies of the School Mathematics Study Group (SMSG) are an example. SMSG researchers were able to study relative effectiveness of teachers from Kindergarten to Grade Twelve over a period of

Table One

Stability Coefficients Across Three Years for Mean Adjusted Gain Scores On the Subtests of the Metropolitan Achievement Tests (from Brophy; p.5)

Grade 2

| | Title 1 Schools (Possible N = 34)[1] | | | | Non-Title 1 Schools (Possible N = 54)[1] | | |
|---|---|---|---|---|---|---|---|
| | Years 1-2 (N = 26) | Years 2-3 (N = 22) | Years 1-3 (N = 24) | | Years 1-2 (N = 42) | Years 2-3 (N = 36) | Years 1-3 (N = 37) |
| WK | .49** | .18 | .10 | WK | .41** | .42** | .45** |
| WD | .26 | .28 | .30 | WD | .63*** | .42** | .50** |
| R | .31 | .00 | -.05 | R | .40** | .42** | .43** |
| A | .24 | -.12 | -.03 | AC | .34* | .45** | .06 |
| | | | | AR | .35* | .33* | .42** |

Grade 3

| | Title 1 Schools (Possible N = 26)[1] | | | | Non-Title 1 Schools (Possible N = 51)[1] | | |
|---|---|---|---|---|---|---|---|
| | Years 1-2 (N = 24) | Years 2-3 (N = 20) | Years 1-3 (N = 22) | | Years 1-2 (N = 44) | Years 2-3 (N = 42) | Years 1-3 (N = 41) |
| WK | .52** | .78*** | .65*** | WK | .39** | .45** | .40** |
| WD | .28 | .19 | .02 | WD | .30* | .26* | .26* |
| R | .54** | .39* | .08 | R | .26* | -.07 | .10 |
| AC | .39* | .51* | .55** | AC | .61*** | .65*** | .44** |
| AR | .28 | -.32 | -.19 | AR | .41** | .46** | .32* |

[1]Classes for a given year were exluded if data were not available for at least 14 students.

* = $p < .05$

** = $p < .01$

*** = $p < .001$

WK = Word Knowledge

WD = Word Discrimination

R = Reading (general scores)

A = Arithmetic (general scores)

AC = Arithmetic Computation

AR = Arithmetic Reasoning

several years. The expectation was that certain teacher characteristics, especially amount of training in mathematics content, would contribute to effectiveness in a stable and significant manner.

Table Two is taken from the SMSG report and shows the relationship between measures of two levels of teacher effectiveness in two mathematics content areas over two years. The eight variables are the combinations of each of these three variables.

The method used to arrive at a teacher effectiveness score centered around use of the achievement test scores of all students in all of the teachers' classes. First, a set of predictor variables (pretests) for each student were placed in a multiple regression equation and an "expected" score was obtained for all students. This group of students was divided at the mean of the "expected" scores into "high" and "low" groups in math computation as well as in math comprehension. Next, "effectiveness" (EFF) scores were computed for each teacher in the group. This score was computed by taking the average of the differences between each student's "expected" score and the student's actual or obtained score on the relevant test. An EFF HI score for each teacher was computed by applying this procedure to those students previously identified as "high" in the total group. The EFF LO score was obtained in the same manner. The magnitude and direction of these average differences for a teacher is an indicator of effectiveness with the referent type of student. For example, a large, positive EFF LO score would indicate that a teacher's "low" students had gained more than was expected of them based on the pre-test battery results. Note that it was possible for a teacher to have, for example, no students defined as "low" on, say, math computation; and therefore no EFF LO score could be

Table Two

Correlation Analysis of Year 1 with Year 2 Effectiveness Scores
X-Population Modern Text
Male Teachers
Male and Female Students Combined
(from Begle, et al., p. 6)

VARIABLE LIST

| Variable | Name | Mean | Standard Deviation |
|---|---|---|---|
| 1 | Year 1 Effective with "lo" students Computation test | 1.22 | 3.37 |
| 2 | Year 1 Effective with "hi" students Computation test | 0.36 | 2.01 |
| 3 | Year 1 Effective with "lo" students Structure test | 0.09 | 2.75 |
| 4 | Year 1 Effective with "hi" students Structure test | -0.28 | 1.98 |
| 5 | Year 2 Effective with "lo" students Fractions test | 0.06 | 2.00 |
| 6 | Year 2 Effective with "hi" students Fractions test | -1.14 | 2.95 |
| 7 | Year 2 Effective with "lo" students Translation test | -0.24 | 0.53 |
| 8 | Year 2 Effective with "hi" students Translation test | -0.04 | 0.55 |

| Variable Number | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 1 | 0.714 (9)* | -0.457 (9) | 0.081 (9) | 0.705 (7) | 0.844 (7) | 0.608 (9) | 0.359 (9) |
| 2 | | -0.013 (9) | 0.375 (10) | 0.352 (8) | 0.510 (8) | 0.372 (10) | 0.252 (10) |
| 3 | | | 0.379 (9) | 0.625 (7) | 0.738 (7) | 0.077 (9) | -0.043 (9) |
| 4 | | | | 0.723 (8) | 0.668 (8) | 0.060 (10) | 0.372 (10) |
| 5 | | | | | 0.915 (8) | 0.806 (8) | 0.271 (8) |
| 6 | | | | | | 0.900 (8) | 0.561 (8) |
| 7 | | | | | | | 0.283 (10) |

* Parentheses indicates number of classes

computed for that teacher. There are some high positive correlations (as between variables 1 and 5) but the pattern is not readily interpretable.

The authors summarize:

> First, we note from the tables in the preceding chapters [our Table 2 is an example] that the standard deviation for each teacher effectiveness score is never close to zero. That is, there is substantial variance in each of these scores. Teachers are not equally effective.
>
> However, our attempts to accound for these variations in terms of teacher characteristics were not very successful. Table 7 [our Table 3] summarizes the analyses. An empty box indicates that teacher characteristics did not account for any significant percentage of the variance in the indicated teacher effectiveness scores. When there was a significant result ($p < .01$), the percentage of variance accounted for by teacher characteristics appears in the box.
>
> Inspection of Table 7 [our Table 3] shows that in exactly one-third of all the cases investigated the results were statistically significant. However, in most cases the percentage of variance accounted for was so low as to be useless in terms of practical school decisions.
>
> In addition, no clear pattern of significant results shows up in Table 7 [Table 3].

Table Three

Percentage of Variance in Teacher Effectiveness Accounted for by Teacher Characteristics

Effectiveness Scores

| | Computation Below Average Students | | Computation Above Average Students | | Comprehension Below Average Students | | Comprehension Above Average Students | |
|---|---|---|---|---|---|---|---|---|
| | Modern Text | Conventional Text | Modern Text | Conventional Text | Modern Text | Conventional Text | Modern Text | Conventional Text |
| Grade 4 Male Teachers | | | | | | | | |
| Grade 4 Female Teachers | | | | | 07 | 06 | 10 | 10 |
| Grade 7 Male Teachers | 03 | 46 | 03 | | 08 | 14 | 07 | |
| Grade 7 Female Teachers | 03 | | 09 | | | | 08 | 41 |
| Grade 10 Male Teachers | | | | | 15 | | 15 | |
| Grade 10 Female Teachers | | | | | | | | |

In an attempt to measure whether a teacher was more effective with high or low students within his/her class, four sets of difference scores were computed for each teacher (column headings in Table 4). For example, in computing a difference, if the mean of the Lo students is subtracted from the mean of the Hi students, and the difference is positive, it means that the teacher is better with the Hi students. If the difference is zero, the teacher was equally effective with Hi and Lo students.

Commenting on tables showing these Hi-Lo differences, the authors note:

> The tables in the previous chapters also show that for each teacher effectiveness difference score the standard deviation is large. Teachers vary considerably in their ability to deal with below average students as compared to above average students or with computation as compared with comprehension. But here too our attempts to explain these variations in terms of teacher characteristics were not successful. Table 8 [our Table 4] summarizes the results of these analyses.
>
> Here, only one quarter of the cases were statistically significant. In several cases, the percentage of variance accounted for is fairly large, but again the lack of any pattern in Table 8 [our Table 4] makes it very hard to see how these results could be used in making practical school decisions.
>
> The above results challenge many of the usual assumptions concerning teaching. Such things as "number of years of experience" and "whether or not a teacher was a math major in college" are not consistently associated with effective teaching in terms of student achievement. Characteristics such as "concern for students" are not consistently related to effective teaching. The results of this study and past research indicate that many aspects of teacher training and selection that are considered to be important cannot be demonstrated to be important in terms of student achievement. The results challenge the assumption that these teacher characteristics affect student learning. (3)

Table Four

Effectiveness Scores - Differences

| | Mean of Above Average Students Minus Mean of Below Average Students | | Mean of Above Average Students Minus Mean of Below Average Students | | Mean of Below Average Students in Comprehension Minus Mean of Below Average Students in Computation | | Mean of Above Average Students in Comprehension Minus Mean of Above Average Students in Computation | |
|---|---|---|---|---|---|---|---|---|
| | Modern Text | Conventional Text | Modern Text | Conventional Text | Modern Text | Conventional Text | Modern Text | Conventional Text |
| Grade 4 Male Teachers | | | | | | | 52 | |
| Grade 4 Female Teachers | | | | 04 | | 06 | | 12 |
| Grade 7 Male Teachers | | 38 | 02 | | 04 | | | |
| Grade 7 Female Teachers | | | 04 | | | | | 56 girls<br>32 boys |
| Grade 10 Male Teachers | | | | | 14* | 44* | | |
| Grade 10 Female Teachers | 36 | | | | | | | |

Figures in box represent percentage of variance in Teacher Effectiveness Scores accounted for by teacher characteristics

* Female students only

It is worth noting that the magnitude of the SMSG correlations is not very different from the ones Brophy reported, but, when the results are interpreted in terms of "variance attributable to the influence of the teacher," little stability can be confidently assigned to the teacher.

Finally, we should consider the results of Laboratory studies which attempted to control variables which create "noise" in the field. The recent studies at Stanford in the summer of 1974 investigate stability of teacher effects in short term teaching sessions (three hours) over three treatments with control of setting (teaching laboratories were used),

group size and characteristics (stratified random assignment of students), and materials. The design eliminated variables such as class differences in aptitude, setting variables, etc., and allowed pure teacher effects to emerge.

Twelve teachers were involved in the study. Students were tested daily at the end of each teaching session. Several types of learning outcomes were examined: recall of information, concepts acquired, and attitudes toward process and substance. Within all treatments and outcomes there were large differences between teachers.(4) Teachers were ranked by day in terms of class means on all outcome measures. Table Five presents the rank-difference correlations across days for all five outcome measures.

The correlations between Day One measures and those of the other days were consistently low. (See Table Five-A.) However, correlations between Days Two, Three, and Four measures were consistently positive and in some cases were high. The results suggest that teachers were consistent with respect to relative effectiveness once the unfamiliarity with the new materials and setting had been overcome. (Possible experimental teaching unit design should take this into account, providing "practice runs" with any new materials, strategies, settings, that are incorporated into them.)

Within-day measures also tended to be correlated by teacher, as illustrated in Table Six, which presents rank-difference correlations between Recall and other measures for Day Three.

Table Five

Coefficients of Correlations Between Outcome Measures over Trials for Days Two, Three, and Four

Recall

| | Trial 2 | Trial 3 | Trial 4 |
|---|---|---|---|
| Trial 2 | --- | .83 | .34 |
| Trial 3 | --- | --- | .54 |
| Trial 4 | --- | --- | --- |

Essay Concrete

| | Trial 2 | Trial 3 | Trial 4 |
|---|---|---|---|
| Trial 2 | --- | .20 | .60 |
| Trial 3 | --- | --- | .74 |
| Trial 4 | --- | --- | --- |

Essay Abstract

| | Trial 2 | Trial 3 | Trial 4 |
|---|---|---|---|
| Trial 2 | --- | .03 | .13 |
| Trial 3 | --- | --- | .41 |
| Trial 4 | --- | --- | --- |

Attitudes (General)

| | Trial 2 | Trial 3 | Trial 4 |
|---|---|---|---|
| Trial 2 | --- | .60 | .58 |
| Trial 3 | --- | --- | .80 |
| Trial 4 | --- | --- | --- |

Attitude (To Self)

| | Trial 2 | Trial 3 | Trial 4 |
|---|---|---|---|
| Trial 2 | --- | .33 | .43 |
| Trial 3 | --- | --- | .44 |
| Trial 4 | --- | --- | --- |

Table Five-A

Selected Rank-Difference Correlations Between Trial One Measures and Those of Other Days Based on Teachers' Rank by Day with Respect to Class Means on all Outcome Measures

| Measure | Trial One v. Trial Two | Trial One v. Trial Three |
|---|---|---|
| Recall | .13 | .01 |
| Essay Concrete | .15 | .20 |
| Essay Abstract | .24 | .02 |
| Attitudes (General) | .24 | .45 |
| Attitudes (To Self) | .14 | .17 |

Table Six

Effectiveness Scores

Rank-Difference Correlations Between Outcome Measures
for Day Three of Stanford Summer 1974 Study

| Measure | Recall |
|---|---|
| Essay Concrete | .48 |
| Essay Abstract | .35 |
| Attitude I | .71 |
| Attitude II | .79 |

Day Two results were similar. Cognitive and Affective Outcomes were not related, however, in Day One or Day Four (which followed a feedback treatment).

Thus, the heavy controls of the Stanford study apparently revealed a consistence of relative effectiveness which has been masked in many field studies. This argues for the inclusion of Experimental Teaching Units which are constructed with respect to specific outcomes in at least parts of the design. It is reasonable to measure a teacher's effectiveness in terms of exactly what it is he or she is trying to teach rather than use broad measures which necessarily are affected by an equally wide range of factors. If broad measures such as standardized achievement tests are used, the design should be as complex and well-controlled as possible.

The results of other investigations along these lines are consistent with those described above. Judging by student gain scores on standard tests, we cannot assume the teachers are consistently effective from year to year. In addition, teacher knowledge of substance is not directly

related to pupil learning, even in relatively technical areas such as mathematics or science content. There is some evidence that some teachers may be consistently more effective than others in the field, which is encouraging, but we are only just beginning to conduct studies that will lead to confident generalizations concerning effectiveness.

How do we explain the lack of stability in teacher effects in field studies and what does it mean for future studies of effectiveness?

The problem would be different if the three types of studies had generated different results. Many researchers felt that the mixed results of field studies were due to the mass of "intervening variables" in field situations and the difficulties attendant to the use of standardized tests as criteria. Tighter controls and more specific measures of learning outcomes, they reasoned, would uncover stable teacher effects. Thus far, that has not clearly been the case, although we may be on the edge of some more penetrating research than we have previously done.

Several possible explanations are offered to explain why stable effectiveness has eluded us in field studies. These explanations help us generate variables for use in the present work.

Classroom Culture. One is that the dynamics of each class (each group of students) are different and compete with teaching competence for variance in outcomes. The variations in "mix" of students may produce powerful effects. Essentially, the social systems of some classrooms may create a "momentum of learning" which propels students to greater efforts and provides all with a more intensive experience. Other classrooms may lack the dynamics that increase effort.

There is both theoretical and empirical support for this position. Thelen has argued consistently for "teachability grouping," contending that the right mix of students, matched with a compatible teacher, generates greater learning and satisfaction.(5) Hunt's appraisal of Upward Bound tested the hypothesis that programs of different social structures would interact with student bodies differing in concentrations of rigid and flexible students to bring about program objectives. He produced considerable support for this hypothesis, which rested on the belief that concentrations of students of different personalities would generate significantly different dynamics which would interact with program types.(6)

A number of studies have tested the proposition that students "pull" behaviors from their teachers. Klein's field study supported this position,(7) as did the carefully-controlled laboratory studies by Hunt, Joyce, Weil and their associates, in which students varying in personality "pulled" teacher behavior in predicted directions across a variety of teaching models.(8)

Rathbone conducted an investigation of the effects of match and mismatch between teacher and student personality which indicated that their personalities interacted significantly with effects that included student satisfaction and response to learning tasks.(9)

<u>The culture of the classroom generated by the students and influenced by the mix of their personalities emerges as a candidate for a variable or source of a set of variables</u>.

The social system of the classroom may have been powerful enough to obscure differences in teacher effects in previous studies. Or, effectiveness

may be partly a matter of interaction between teachers and various types of social systems. Perhaps, even, effective teaching is partly a matter of generating a dynamic social system, a dimension of teaching influence which has had relatively little attention.

Learner-Material Interaction. A second explanation of the lack of stability of teacher effects is that substantive learning may be produced primarily by the interaction of learners with materials of instruction. If this is the case, fluctuations in learner effort and ability, fluctuations in materials, and interaction between learner and materials would account for a large portion of variance in measures of learning, thus reducing the contribution of the teacher.

One solution is to attempt to remove the effects of interaction between learner and materials by the use of control.[10] The reciprocal solution is to seek effectiveness as a materials-related phenomenon and to include natural use of materials as a variable. Either solution focuses on a second set of variables, those associated with materials and learner interaction with them.

A third explanation is that gain scores are not stable enough to be reliably used as indicators of teaching effectiveness. Soar has pointed to the large contribution of prior student achievement to rank in class after treatment, the effect of prior achievement on gains, the instability of student gain scores once the effects of prior achievement have been removed, and to the nonlinearity in response of students to environments.[11]

If student gain scores are suspect, we may simply lack an adequate criterion of teacher effectiveness. If they bear curvilinear relationships to teacher behavior and other variations in the environment, previous techniques for handling data may have obscured relationships which existed in them.

A fourth explanation is that there are teacher behaviors which are associated with effectiveness but that teachers do not consistently employ those behaviors. From this stance, there may be such a thing as effective teaching, but it may be embodied in different persons at different times. Support for this position comes from the mild but relatively consistent association of certain teacher behaviors with some kinds of student learning and the contention that variations in certain kinds of teacher behavior are associated with learning.(12, 13)

It may be important to determine whether teachers fluctuations in effectiveness are related to changes in their behaviors. Whether "pulled" by students or some other force, teachers may manifest greater or lesser frequencies of behavior in patterns which are influential on learners.

Finally, it may simply be that the solution is elegantly simple. Effectivness may simply differ by student, objective, and time, as well as social context. Medley argues that:

> ...an effective teacher can be recognized, not so much by what he does as by when he does it; that he can be recognized not by which competencies he possesses so much as by how many there are. It also implies that the effective teacher will differ from the ineffective teacher primarily in his control over the repertory of competencies he commands; in his ability to adapt his behavior to the pupils, the purpose, and the situation in which he operates; and

> most important of all in his ability to learn from his own experience, so that his competence is always increasing. This definition views teacher competence as a dynamic rather than a static thing: a direction in which one moves rather than a point at which one arrives.
>
> The function of process-product research is no longer seen as that of finding out which competencies a teacher should learn to use, and which he should ignore; the function of such research is to provide information which will help the teacher decide which competency is likely to be useful in a given instance. It will accomplish its purpose by asking, not which procedure effective teachers use most frequently, as it does now; but instead it will ask under what conditions an effective teacher uses this procedure, for what purposes, with what kind of pupils, and so on. Medical research does not concern itself with whether the best doctors use penicillin more often than, say cortisone; it concerns itself with what penicillin is good for, and what parameters or conditions determine its effects; as well as with what cortisone is good for and what parameters determine its effects. Educational research should likewise cease to ask whether good teachers teach more enthusiastically than poor ones; instead it should ask what effects teacher enthusiasm has with what type of pupil, under what conditions.
>
> Chances are that every competency listed in the fifty studies reviewed by Rosenshine, et al. (1971, 1973), is effective for some purpose, with some teachers and some classes. What a teacher needs to know is when, how, with whom, and for what purpose each competency is most likely to be effective. This is what future research in teacher effectiveness should produce: descriptive information rather than the largely useless, value-laden "validity" data it has sought to produce in the past.(14)

If effectiveness turns out to be specific to intersections of objectives, learner characteristics, and teacher behavior, then effectiveness is not only complex but is characterized by what we might call matricity. That is, if we draw a three-dimensional matrix of objectives, learner responsiveness, and teaching moves, effectiveness defined as an intersection of appropriate points along these dimensions could only produce effects across one point of each of the other dimensions. The concept of the "effective" teacher would be one who could constantly adjust his/her behavior and objectives to intersect productively with learner responsiveness. He/She would have to possess a

great deal of artful flexibility, because learners are always in motion. Motivation, concentration, self concept, etc., fluctuate from day to day.

Thus, the more effective teacher would be in the "right place at the right time" more often than the others, boosting learning by adjusting tasks, materials, structure, and method.

Such a change is not inconsistent with the "dynamics of the classroom group" theory described above.

It might well be that synergistic ability (the ability to create a classroom climate that is more effective than would be expected from the mere summation of its individual components, i.e. teacher, students, materials, and physical plant) might represent one component of effectiveness and that matching ability might represent another component. A teacher who combined both types of effectiveness would stand out more than one who had developed only one of the two. Prior studies have not explored either of these possibilities in a powerful enough way to reveal them.

## Part II

## DIRECT SOURCES OF VARIABLES TO BE STUDIED

Previous research can be grouped into categories which contain the sources of variables which might affect effectiveness. In the next pages the following sources will be examined in order and in relation to each other:

Research into General Methods.

Research into Curriculum-Specific Methods

Classifications of Learning Outcomes

Classifications of Learning Materials

Characteristics of Learners

## Is Effectiveness a Choice of Method?

How do we use distinctions between methods in the search for the effective teacher?

It is clear that there are a variety of educational methods, both general ones and subject specific approaches. Are there some methods powerful enough so that a teacher who selects and masters them will become more effective? Or are methods relatively equal but is it important that a teacher master one and learn to use it powerfully?

We need to consider evidence about the effects of different methods, differential effectiveness of teachers between and across methods, and ways of utilizing the task requirements of methods in research to identify the effective teacher.

### Differential Effects of Methods

Research on the effects of methods has been puzzling. The bulk of research has compared discovery and expository methods generally, although not always, with the expectation that discovery methods would be superior. The second most frequent comparison has been between student-directed and teacher- or system-directed methods. Recently a number of carefully-controlled studies have utilized both dimensions, hence:

Control Dimension

| Cognitive Process Dimension | Student Centered | Teacher Centered |
|---|---|---|
| Discovery (Inductive) | | |
| Expository (Deductive) | | |

There are two important emphases in methods-related research. The first is on the learning of process. The question is: are there certain processes(such as inductive thinking) which have to be taught directly? For example, inductive methods may be necessary to teach inductive processes. The second is whether substantive and attitudinal outcomes other than process are better learned as a result of specific methods of teaching-learning processes. Do certain methods, we ask, increase recall of information, concepts learned, etc.?

The results of experimentation with both dimensions has been less than clear-cut. Witrock[15] and Shulman and Keislar[16] have written exhaustive and penetrating reviews of the literature on discovery and expository learning, and concluded that there is little clear evidence favoring one over the other with respect to any class of learning outcomes. Worthen[17] suggested that research design flaws had prevented any clear examination of differences between the two general methods and demonstrated, in a

superbly-designed study, that each had distinctive and theoretically-predictable effects. For example, expository instruction increased immediate recall of information while discovery instruction increased delayed recall.

Very few investigations have been conducted with the thorough attention to the details of design which characterized Worthen's, but the few that have support his contention that carefully articulated methods constructed to achieve different learning outcomes may well do so.

An example is van Hout's recent investigation[18] using the following design:

Figure One

Design of the Experiment (after van Hout)

| | | egruleg | | | ruleg | | |
|---|---|---|---|---|---|---|---|
| teacher-centered | teacher group | 1<br>I | 2<br>II | 3<br>III | 4<br>IV | 5<br>V | 6<br>VI |
| student-centered | teacher group | 7<br>VII | 8<br>VIII | 9<br>IX | 10<br>X | 11<br>XI | 12<br>XII |

Methods showed no consistent effects but different types of student groups did differ on outcomes. An interaction between instructional procedures, teachers and students seemed evident.

The results are typical of the interpretation of many researchers and consistent with the statement by Medley which was included a few pages back. Stated as a thesis:

$$E_{os} = T \times L \times M$$

where $E_{os}$ represents the proposition that effectiveness will be outcome-specific and a function of combinations of teachers, learners, and methods. The thesis asserts that we probably live in a world of aptitude-treatment interactions. That is, each individual is unique. He or she affects and is affected by other people and environments differently.

Subject-Specific Methods Research

Studies of different methods in reading and arithmetic have also produced complex results, but have developed another base of findings which can be interpreted to guide present research. One important result is the concept that method is partly entwined with content - there is content in method. Problem-solving and concept-oriented approaches to arithmetic have improved the learning of concepts and principles for solving problems.[19,20] Phonics-analysis methods for teaching reading improve phonics learning in children. In both cases the process of teaching-learning contains content which can only be expressed as process. A problem-solving approach to the teaching of problem-solving is simply the least circuitous route.

The findings of the great cooperative research study of first-grade reading support Chall's[21] analysis of the vast reading literature - the methods that contain much of the content of phonic analysis (basal plus phonics supplement, experience approach, etc.) tend to produce superior results in word-analysis skills. Where the process of word-analysis is embedded in the method, superior word-analysis tends to result.[22]

Methods in reading can be characterized in terms of the precision with which word-analysis techniques (the content of decoding) are dealt with. The most precise approaches control the sequence with which skills are introduced and word-analysis cues are studied. Content is controlled by the needs of the skill sequence. The traditional basal readers control vocabulary and content but are somewhat less precise in word analysis. The experience and self-selection approaches control content not at all - the learner selects the content, and word-analysis skills are introduced as the opportunity and the need arise.

Reading Methods Classified by
Precision and Control of Content: A Typology

| Precise (Synthetic) | Less Precise (Analytic) | Learner-Centered |
|---|---|---|
| High Sequence of Content | Moderate Sequence of Content | Interest-Controlled Content |

For many years reading authorities favored the learner-centered and analytic approaches but the trend has shifted and the synthetic approaches

are now favored, with recent empirical evidence somewhat supporting them, though with a mixed pattern of findings. (The experience approach, for example, frequently shows up well, although it is the most learner-centered approach.)

Joanna Williams[23] suggests that the reading methods are composed of teaching-learning tasks some of which are characteristic of each method. The tasks are logically connected to particular classes of learning outcomes. The synthetic approaches, for example, are characterized by a greater density of decoding-related outcomes. In Figure Two the theoretical picture is depicted:

Figure Two

| | Methods | | | | | | Outcomes |
|---|---|---|---|---|---|---|---|
| | Synthetic | | Analytic | | Learner-Centered | | |
| Common Learning Tasks | X | X | X | X | X | X | Type A |
| | X | X | X | X | X | X | Type B |
| | X | X | X | X | X | X | Type C |
| Unique Learning Tasks | X | X | X | X | X | X | Type A |
| | X | X | X | X | X | X | Type B |
| | X | X | X | X | X | X | Type C |

All methods ultimately aim at the same classes of outcomes (See Section IV, Outcomes, Materials, and Learners) so any differential effectiveness between them would most likely be a result of the power and directness of the method-unique learning tasks. (The synthetic approaches have a greater density of direct phonics-content-related tasks which may account for their general superiority in decoding outcomes over the analytic approaches.)

Figure Three shows an analysis of two basal reading series and the experience approach in terms of learning tasks and outcomes. The sequence of learning tasks in the most common strategies suggested in the manuals for the approaches are indexed according to the learning outcomes they are presumably directed toward.

For example, the Bank Street approach begins by the teacher discussing the context (BS1). The second step (BS2) represents the discussion of selected sentences. BS3 presents the vocabulary, BS4 involves private reading with several outcomes in mind, and BS5 involves public reading with inference as the desired outcome. BS6 deals with concept attainment as the activity and visual discrimination the outcome. The final step in the Bank Street approach again deals with concept attainment, but the desired outcome concerns structure.

As predicted, the approaches emphasize different outcomes and tasks, but all include word-attack skills and comprehension skills.

Within methods, teacher effectiveness may be a function of the consistency and skill with which the tasks characteristic of the method are employed. Teachers trying to use a method but unable to use its learning tasks would be likely to diminsh student achievement unless they compensated in some way (as by improving student motivation or independence).

Figure Three

ACTIVITY-OUTCOME MATRIX

FIRST CUT

OUTCOMES

| Teacher Activities | Word Attack | | | | | Comprehension | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Discrimination | | | | | | | | | |
| | Visual (Initial, Medial, Final) | Audio | Structural | Contextual | Linguistic Generalization | Vocab Recog Reg Irreg | Sentence | Context | Inferring | Predicting |
| 1 Present | L2<br>L5 | L1 | | | | L3<br>BS3 | | | | |
| 2 Discuss | | | | | | | BS2 | BS1<br>E1 | | L6 |
| 3 Concept Attainment Formation Exercise (sorting-matching) | L7<br>E5<br>BS6 | E5 | BS7 | E4 | E6 (opt) | BS8 | | | | |
| 4 Public Reading | | | | | | | | E3 | BS5<br>L4A | |
| 5 Private Reading | | | | BS4 ← | | | | → E7<br>BS4 | | |
| 6 Dictating | | | | | | | E2 ← | → E2 | | |
| 7 Workbook Exercise Programmed Inductive | L4 ← | | | | | → L4 | | | | |

Materials Code

$M_1$ $M_2$ $M_3$

H M L

Reading Approach

BS = Bank Street Series

L = Lippincott Series

E = Experience Approach

From the study of methodology in reading we can generate the following hypotheses:

A. Methods can make a difference--they boost different learning outcomes. Hence, choice of method can, possibly, contribute to effectiveness.

B. Methods are composed of teaching-learning tasks and, although methods share tasks, they are characterized by distinctive ones. The tasks logically relate to different classes of outcomes. The consistency and quality with which a teacher implements these may account for within-method differences in effectiveness.

C. A teaching behavior that enhances the implementation of one method might inhibit the effects of another. Thus, unless method is controlled for in a study of teaching behavior in reading, the findings could be misleading.

D. Apparently most teachers rely heavily on materials of instruction which are generally constructed according to one of the methods described above. Hence, effectiveness is probably most clearly seen within methods--in the efficiency and skill with which teachers present the learning tasks to the children.

Strangely, there is no recent survey of reading practices from which we can judge the extent to which various methods are actually used by teachers or how faithfully they follow the handbooks representing the various methods or the materials which have been prepared for children. It is generally believed that most teachers follow the materials rather faithfully and attempt to implement the methods they represent.

During the "Known Sample" phase of the BTES studies a questionnaire was distributed to two hundred teachers asking them to describe their approaches to the teaching of reading and arithmetic.

The results indicate that a few textbook series dominate reading instruction in California (see Table 7). Most teachers reported that they orient instruction around a "basal" series and most (about 70%) use its "Teacher's manuals" as guides.

Nearly all teachers employ reading groups and these emphasize decoding skills for the less able readers and comprehension for the more able. The learner-centered approach (experience methods and methods built around self-selection of materials are rarely used) as are the "extreme" decoding methods (ITA, for example or Words in Color). Phonics workbooks and library books are the most widely-used supplementary materials. Reading instruction occupies about one-third of all instructional time in the two grades, with somewhat more than that in grade two and slightly less in grade five.

Nearly all reading instruction is organized in groups or individualized with much of the individual instruction built around materials such as workbooks.

Except for continual attention to promoting positive attitudes toward reading, teachers emphasize distinctly different objectives, in both grades two and five, for those students who they have diagnosed as the most and least capable readers. For the top and middle thirds the emphasis is on advanced and basic comprehension, respectively. For the bottom third decoding and basic comprehension receive the greatest attention. "Making decoding automatic" receives relatively little attention for any group at either grade level, but is by no means absent as an objective.

Table Seven

Most Frequently Used Reading Series
As Named By Teachers In the BTES Study

| Book | No. of Teachers Using Book |
|---|---|
| Harper & Row | 41 |
| MacMillan and Co. | 25 |
| Scott Foresman<br>Open Highways and drill separate - grade 2 | 15 |
| J. B. Lippincott | 7 |
| Open Court | 6 |
| SRA | 5 |
| Ginn Co.<br>Trails to Treasures | 4 |
| Houghton-Mifflin | 4 |
| MacMillan and Co.<br>Bank Street | 4 |
| Ranson Reading Program<br>supplemental | 4 |
| All others<br>(11 series) | 22 |

Reading specialists, aides, volunteers, and others were present in many of the classrooms and were generally occupied in assisting individual learners or in preparing instructional materials.

Within the reading field there have been very few studies of teacher behavior within or across methods, and these are very recent and unreplicated. Thus, we are in the early stages of systematic inquiry into how teachers actually behave within and across methods. Decision making is as unstudied as are the transactions between teachers and learners.

## Arithmetic Methods

Begle[24] has suggested a two-way classification of arithmetic methods. One dimension refers to content and ranges from rote to meaningful, and the other refers to process and ranges from the structured to the inductive.

Rote content means content presented without a context of mathematical concepts which have explaining power for the student. Meaningful content implies the presence of those concepts.

Structured process involves a sequencing of learning tasks which guide the student to mastery of the material, whereas inductive methods place emphasis on concept formation, inducing the student to arrive at his own conclusions. This is illustrated in Figure 4.

Figure Four

Classification of Methods Employed in Curricula

in Elementary School Arithmetic

| | | Content | |
|---|---|---|---|
| | | Rote | Meaningful |
| Process | Structured | A | B |
| | Inductive | C | D |

Approaches fitting into the center of Cell A emphasize the bare bones of computation and problem-solving principles and present algorithms, number facts and principles in a highly-structured manner. In Cell B mathematics content is presented to provide a mathematically-meaningful base both for computation and understanding of the nature of mathematics. Cell C programs are a rarity - inductive and rote content are not compatible. However, computation <u>can</u> be taught inductively. Cell D combines mathematical content with the concept-formation process.

At the start of the academic reform movement most arithmetic programs belonged in Cells A and C. The impact of SMSG, especially, moved programs to Cell B. The most common program in California presently straddles Cells B and D.

Very few recent investigations have studied how teachers implement various methods or what the normative practices are today. Experts in the field believe that most teachers are heavily influenced by the materials which are provided. If that is the case, then differences in effectiveness are likely to be found in the efficiency and skill with which teachers organize the children and present the learning tasks to them. The BTES survey indicates that one textbook series is by far the most popular (Houghton-Mifflin) and, together with one other, was used in 78% of the classrooms surveyed (see Table 8). The teacher's guide is used "usually" or "often" by half of the teachers. Arithmetic textbooks themselves are more completely self-instructional than are readers, and the manual is less necessary to make the activities clear to teachers or students, which is probably why fewer teachers depend on the teacher's guides for arithmetic as compared to reading.

Only about 30% of the teachers use manipulative materials but the same proportion use homemade materials and about a quarter employ workbooks.

Seventy-five percent of the teachers teach arithmetic between one-half and one hour each day. Large group (whole class) instruction is used somewhat, but groups and materials-based individualized instruction are the mode.

Computation receives the greatest emphasis for the least capable students with mathematics concepts and application to problems receiving greater emphasis for the higher-achieving students.

Table Eight

Most Frequently Used Mathematics Series
As Named By Teachers In the BTES Study

| Book | No. of Teachers Using Book |
|---|---|
| Houghton-Mifflin | 53 |
| Addison-Wesley | 12 |
| Silver Burdett | 4 |
| Scott Foresman Developing Math Programs | 3 |
| All others | 17 |

As in the case of reading, the major methods are composed of common and distinct learning tasks which are easily identified, and are logically related to different classes of learning outcomes. So it should be feasible to study differences between teachers' handling of the tasks and then relate those differences to achievement, especially since so few textbook series appear to dominate instruction.

In the case of both reading and arithmetic the technology for the study of teaching has not yet been applied with careful attention to the nature of the different methods. Both teachers and methods have been studied, but the two have not yet been properly brought together. A task analysis of methods reveals variables which simply have not yet been adequately studied.

A few observations need to be made about the literature:

Curriculum-related studies have been ambiguous, expecially as so few investigations have included the teacher as a variable.

Highly-structured, individualized, "tutorial" curricula often come out well. IPI, for example, has an impressive record.[25]

Head Start and Follow-Through Programs have been much-criticized and often appear ineffective, but some programs, such as Spaulding's,[26] have consistently shown impressive results. Soar's careful research is beginning to identify teacher characteristics associated with pupil gains in early childhood programs.[27] Behaviors increasing individual attention appear to be especially promising. Brophy[28] contends that there is considerable support for the effects of tutoring as an aspect of method.

Almy's careful study indicates that many teachers do not adjust their behavior enough to be able to implement specific methods, and that this may have powerfully affected previous studies of methods.[29]

Finally, the major interpretation of the extensive cross-national investigations is that curricular content, as embedded in methods and materials, affects learning.[30] No surprise here, but it can too easily be overlooked.

Part III

STUDIES OF TEACHING BEHAVIOR: THE PROCESS VARIABLES

The number of dimensions of teaching behavior which have been studied is also relatively small, despite the proliferation of systems for studying teaching. The more than one hundred existing category systems have actually employed no more than fifty categories altogether, organized in terms of five major dimensions of the teaching process (each with a relatively high frequency of occurrence) and a dozen minor ones.

The major dimensions of teaching process which have been studied are:

a. The affective, including social-climate-related behaviors.

b. The cognitive-logical, especially the study of teaching moves which exercise higher-order and divergent cognitive activity by students, and which lead to the establishment of substantive or logical linkages of subject matter.

c. The instructional skill-oriented, including studies of "micro-skills" related to teaching strategies and roles (lecturing, discussion, etc.) and moves related to the establishment of rapport with students.

d. The management skill-oriented, including the study of classroom organization, structuring moves, the handling of materials, etc.

e. The social system of the classroom, generally approached through micro-ethnological methods.

These five aspects or dimensions of teaching behavior contain the most developed concepts for the study of the processes of teaching. Some other aspects, such as "nonverbal" behavior, have been studied, but the work is in its beginning stages and variables are not yet available which clearly add definition to the study of verbal and social behavior.

Before considering each of these dimensions and the variables which define them, it is important to explore the general picture which is emerging from the study of the teaching process.

## The General Picture of Classroom Interaction

First of all, the picture that has emerged is of an institutional form (the classroom) whose characters share considerable types of behaviors the world over.

Bellack and his associates have characterized the verbal transactions in the classroom as a "language game" in which teachers and students employ a limited number of moves to explore the substance of the curriculum.(31) These moves, moreover, follow regular patterns or cycles. Reviewing fifty years of studies, Hoetker and Ahlbrand have concluded that the studies of teaching reveal that a pattern of recitation dominates the classroom and has done so throughout the period.(32) It has been suggested that the nature of classroom behavior is a structural response to the character of the school as an institution and the purposes and conventions which pervade it.

Evidence to support this contention lies in the world-wide similarity of findings where and when the same category systems have been used. The systems devised by both Flanders and Bellack have been used in a number of countries and the same general picture has emerged. In a striking study reported in L'enseignement, the Bellack, Flanders, and Joyce systems were all used to study French Canadian classrooms, including elementary and secondary classrooms, several subject areas, and even television teaching. The results were virtually identical to those obtained by using those systems to study American teachers and children.(33)

The International Education study not only contends that differences in student learning across nations can be explained by differences in curriculum content but also suggests the strong probability that across-national differences in teaching behavior are not great enough to affect learning.(34)

Following their recent survey of classroom practices, Goodlad and his associates have suggested that there is something in the character of the school and classroom which resists innovation and changes of all types.(35) Their study was generated to determine the impact of the last twenty years of educational reform on teaching practices. In particular, the period has seen the creation of new instructional models and efforts to persuade and train teachers to use them.

The outlines of the reform movements of the last quarter century are by now well known to almost everyone. The efforts began with the generation

of models for "nongrading" the school, an effort in which Professor Goodlad is one of the leaders. It was also the period of technological revolution in which mediated instructional systems were developed and disseminated by foundations, industries, and federal actions. New patterns of school organization were created, including team teaching, and the development of instructional centers and support services. Since the early 1950's the vast academic reform movement has occurred with the development of new approaches to teaching in the humanities, sciences, and social sciences. Concurrent has been the devise of new models of primary education ranging from systematic instructional models based on learning material, to personalistic models based on child-centered learning theories. During the same period the "Great Debate" over reading practices reached its boiling point with the result that a variety of models of instruction in reading emerged newly or were resurrected from past efforts.

Today's schools have available to them the greatest variety of alternative teaching models that have ever been assembled. Modern communication systems enable schools to learn about these models, as well as receive consultation from persons knowledgeable in their use. In addition, thousands of new schools opened after 1950, offering the opportunity to try out the new models of curriculum and teaching and to build new forms of school organization without tearing down entrenched practices. The rise of the organization of teaching professions has brought with it increased opportunity for teachers to take part in curricular and

instructional decisions. The period has also seen rebellion by students and vast public criticism of the schools, both factors which could be expected to encourage the implementation of innovations. Finally, school architecture has been liberated from the "egg-crate" model and most of the newer architectural concepts have promoted collegial teaching and the use of newer instructional models.

In other words, Goodlad and Klein's report comes at a time when it should permit us to see the effects of the nation's classrooms reform efforts of the last 25 years.

Although they found that principals and teachers "alike spoke frequently of individual needs, individual differences, and provisions for both..." "Our data lead to the firm conclusion that the overwhelming majority of our 150 classrooms - in organization, subject matter, materials and mode of instruction - were geared to group norms and expectancies rather than to individual differences in learning."

They saw very little application of learning principles, either in diagnosis or in prescription, and they concluded that, although the teachers were generally relating positively toward the children, they saw very little evidence that the innovative models of teaching were being utilized.

For example, the observers reported few instances of emergent teaching models, that is, those in which teachers and children were working together to define goals and carry them out.

In addition, "the tests being used in the schools were almost uniformly of a grade-norm variety and overwhelmingly in the tradition of group achievement and intelligence testing." They concluded that criterion-referenced tests were virtually "nonexistent." Reading tests, even those which could be used for diagnosis, were generally translated into grade equivalents and regarded in that fashion. They concluded that the traditional graded school of the industrial society of the past with its commitments to grades, lower order objectives, and convergent activities continues to dominate the American scene.

"The highly recommended and publicized innovations of the past decade were dimly conceived and at best partially implemented in schools claiming them. The novel features seem to be blunted in the effort to twist the innovation into familiar conceptual frames or established patterns of schooling. For example, team teaching more often than not was some pattern of departmentalization and nongrading looked to be a form of homogeneous grouping. Similarly, the new content of curriculum projects tend to be conveyed with the baggage of traditional methodology." This picture emerged even in the schools which were selected because of their reputations as innovators. In those, and in some of the others, many of the principals and teachers believed that the teaching was innovative. The observational records, however, fail to bear that out. "The instructional environment of the classes we visited, more in grades 1 and 3 than in kindergarten, were characterized by telling, teachers' questioning individual children

in group settings, and an enormous amount of seemingly quite routine seat work. Rather than probing, seeking, inquiring, children were predominantly responding and covering. Even when using the materials of curriculum projects presumably emphasizing "discovery" methods, people appeared bent on covering the content of textbooks, workbooks and supplementary reading material."

"We were struck. . .by the sameness of activities within any given room, whether or not designed for enrichment or individual supplementation of the regular program. We rarely saw an abrupt turn-around from the kind of instruction we have described to vigorous, constructive, play acting, or dancing. Independent activities when provided meant more of the same reading (but with different books), writing, and coloring." They go on to ask "Is some stereotype of schooling so built into our culture that it virtually shapes the entire enterprise, discouraging or even destroying deviations from it?"

In their summary, Goodlad and Klein conclude that the extensive reform movements of the last 25 years have barely touched the classroom. They attribute this to two causes. One is that the entire organizational and social context of the schools has not been conducive to innovation. Schools have not developed dynamic missions and organized themselves to select clearly from among the available models of teaching. They have not chosen, consciously and forcefully, the models which best suit their mission, their preferences, or the characteristics of their children. Most schools,

in other words, adopt the prevailing mode of education without serious reflection on the alternatives. Second, they blame the training of teachers. Teachers not only work largely alone but "it would appear that neither preservice nor inservice teacher education programs have provided them with the precise pedagogical understandings and skills required for diagnosing and remedying the learning programs and needs of individual pupils."

Although every study of teaching has shown variability in teacher behavior, from Goodlad's perspective there are large structural similarities in classrooms which are manifested in similar responses to setting, instructional demands, and innovation.

From that perspective, variations in teaching are variations on common themes. Only rarely can we expect to see teaching whose character stands out as clearly and definitely unusual.

Reflection from this perspective offers a number of possible explanations about the results of previous attempts to find relationships between teacher behavior and learner achievement and also provides a number of considerations about the selection of variables for the present study.

First of all, it may help to explain the instability of teacher effects. Individual differences among learners account for much of the variance in achievement, especially higher-order learnings. If teachers are relatively homogeneous along many dimensions of behavior, then learners in different classrooms are being exposed to relatively similar environments. Thus,

fluctuations in learner responsiveness and the characteristics of classroom social systems would be more likely to explain variability in achievement than individual differences among teachers.

Variance in teaching behavior seen as variation on a common theme would not compete consistently with variations (and even greater fluctuations) in learner behavior to account for variance in outcomes. To compete for variance, differences in teaching behavior need to be large or powerful or both. If differences are variations on a common method they are more likely to be clinically weak, even in instances where they are statistically large.

Second, the recitation-method, the most common, is materials-oriented. Much of the teacher's time is occupied with the process of bringing learners together with materials and, subsequently, inducing the learners to reflect on their contact with substance.

This has the effect of <u>increasing</u> the influence of learner motivation and ability on learning outcomes. Effectiveness becomes a matter of helping learners contact materials and boosting their achievement beyond that which they would otherwise do for themselves.

In the summer of 1974, at the Stanford Center for Research and Development in Teaching the staff of the Program on Teaching Effectiveness carried out a study designed partly to determine what teachers helped learners achieve (in three hours of teaching) beyond what learners achieved for themselves in a one-hour "read-only" condition. Both higher-order and lower-order outcomes were studied. The results are presented in Table 9.

Table Nine

Outcomes for "Teacher Taught" and "Read Only" Conditions Over Three Days

| Variables | Day 1 | | Day 2 | | Day 3 | |
|---|---|---|---|---|---|---|
| | TT Means (SD) | RO Means (SD) | TT Means (SD) | RO Means (SD) | TT Means (SD) | RO Means (SD) |
| Recall | 40.17 (7.35) | 39.62 (3.62) | 40.26 (7.03) | 32.62 (13.59) | 37.07 (9.20) | 38.50 (7.07) |
| Essay (Concrete) | 12.22 (5.69) | 11.75 (7.40) | 11.67 (4.74) | 12.12 (5.79) | 11.15 (5.35) | 13.87 (6.68) |
| Essay (Abstract) | 2.04 (1.74) | 1.87 (2.41) | 2.09 (1.66) | 2.62 (1.59) | 2.20 (1.88) | 2.50 (2.45) |
| Attitude I | 57.79 (11.06) | ----- ----- | 59.15 (8.84) | ----- ----- | 55.32 (10.44) | ----- ----- |
| Attitude II | 15.37 (2.88) | ----- ----- | 15.89 (2.68) | ----- ----- | 15.21 (2.72) | ----- ----- |

TT = "Teacher Taught"

RO = "Read Only"

The pattern of results, as demonstrated in Table Nine, is inconsistent. In most cases, differences between the "teacher-taught" groups and the "read-only" group are small, with a slight advantage for the "read-only" group. The teaching (which was recitation-oriented) boosted learning on all measures over the "read-only" group on Day 1. However, in Days 2 and 3, the Essay scores (both concrete and abstract) for the "read-only" condition exceeded those of the "teacher-taught" condition. (For recall, "teacher-taught" scores exceeded "read-only" scores until Day 3.)

Clearly, exposure to materials alone produced learning. In many cases, teachers were unable to boost outcomes significantly above what the students could do for themselves. The pattern of results, when the three outcome measures are examined by teacher (Tables Ten, Eleven and Twelve) indicate much variability between teachers. Also notable is the variability for individual teachers across outcome measures. For example, Teacher 2 achieves higher recall scores than the "read-only" group on each of the three days. However, the scores fall below those of the "read-only" group on Days 2 and 3 for both Essay (Concrete) and Essay (Abstract) measures.

This research, then, seems to support the premise that learner differences in motivation and ability account for most of the differences in outcome measures; though present, teacher effect does not appear to be the greatest source of within-class variance.

Table Ten

Class Means on Recall Measures by Teacher in Summer 1974 Stanford Study

| Teacher | Class Means | | |
|---|---|---|---|
| | Day 1 | Day 2 | Day 3 |
| 1 | 37.88 | 45.00 | 40.75 |
| 2 | 39.63 | 41.50 | 41.25 |
| 3 | 42.25 | 39.38 | 38.38 |
| 4 | 40.63 | 40.38 | 36.38 |
| 5 | 42.13 | 41.25 | 38.63 |
| 6 | 36.25 | 36.13 | 33.38 |
| 7 | 40.50 | 39.13 | 36.13 |
| 8 | 35.63 | 44.13 | 38.50 |
| 9 | 37.13 | 36.63 | 33.50 |
| 10 | 40.75 | 41.38 | 37.00 |
| 11 | 45.50 | 39.75 | 34.13 |
| 12 | 43.88 | 38.50 | 36.88 |
| "Read-Only" Group | 39.62 | 32.62 | 38.50 |

Table Eleven

Class Means on Essay (Concrete) by Teacher in Summer 1974 Stanford Study

| Teacher | Class Means | | |
|---|---|---|---|
| | Day 1 | Day 2 | Day 3 |
| 1 | 11.88 | 14.75 | 12.88 |
| 2 | 14.63 | 10.38 | 11.50 |
| 3 | 15.00 | 11.75 | 12.75 |
| 4 | 13.63 | 11.26 | 12.38 |
| 5 | 12.50 | 11.50 | 11.25 |
| 6 | 10.00 | 11.13 | 12.00 |
| 7 | 10.88 | 14.38 | 11.13 |
| 8 | 10.88 | 9.38 | 13.38 |
| 9 | 10.25 | 8.63 | 8.25 |
| 10 | 12.00 | 12.75 | 13.88 |
| 11 | 9.88 | 13.13 | 5.88 |
| 12 | 15.13 | 11.13 | 8.13 |
| "Read-Only" Group | 11.75 | 12.12 | 13.87 |

Table Twelve

Class Means on Essay (Abstract) by Teacher in Summer 1974 Stanford Study

| Teacher | Class Means | | |
|---|---|---|---|
| | Day 1 | Day 2 | Day 3 |
| 1 | 2.13 | 2.50 | 2.63 |
| 2 | 2.00 | 2.25 | 0.63 |
| 3 | 1.88 | 3.00 | 2.38 |
| 4 | 1.88 | 0.88 | 2.38 |
| 5 | 3.88 | 2.75 | 3.38 |
| 6 | 2.00 | 1.88 | 1.63 |
| 7 | 0.88 | 1.38 | 2.63 |
| 8 | 1.50 | 2.00 | 3.88 |
| 9 | 1.75 | 2.13 | 1.50 |
| 10 | 2.25 | 1.88 | 1.88 |
| 11 | 2.50 | 1.75 | 2.00 |
| 12 | 1.88 | 2.75 | 1.63 |
| "Read-Only" Group | 1.87 | 2.62 | 2.50 |

Clearly, exposure to materials alone produced learning.

In a separate investigation, Hunt and Joyce found that when learners were exposed to intensively-conducted, classroom-unusual models of teaching increases in lower-order measures, compared to control groups, did not take place in less than four hours whereas higher-order outcomes (the model-relevant ones) increased in as little as forty-five minutes of teaching. They speculated that the effects of teaching as such can be more easily perceived as increases in higher-order outcomes.(36)

Thus, although many of the process variables which are described below appear to have relatively low relationships to pupil learning, many might have been more powerful if more higher-order and affective outcomes had been controlled for as influencers of pupil learning.

## Stability of teacher behavior in the affective, cognitive, and skill-related domains

If consistency or stability of effectiveness is apparently fairly low, what about stability of style? *

There have been relatively few studies of stability of teacher behavior as such. One, by Brown and Joyce,(37) produced the following correlations of indices of behavior across four lessons (see Table 13). Each lesson was with groups of 2-4 students and the subject matter was decoding skills in reading.

*See also Shavelson, R., and Demsey, N., Generalizability of measures of teacher effectiveness and teaching process. San Francisco: Far West Laboratory for Educational Research & Development, Beginning Teacher Evaluation Study, Technical Report 75-4-2, April, 1975.

Table Thirteen

Correlation Coefficients among the Indices of Teaching Style in Four Lessons by 29 Student Teachers

| | Lesson | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Sanctioning (Positive) | 1 | | | | |
| | 2 | .10 | | | |
| | 3 | -.24 | .20 | | |
| | 4 | .05 | .26 | .25 | |
| Sanctioning (Negative) | 1 | | | | |
| | 2 | .06 | | | |
| | 3 | .24 | -.30 | | |
| | 4 | -.07 | .25 | -.03 | |
| Sanctioning (Convergent) | 1 | | | | |
| | 2 | .14 | | | |
| | 3 | -.24 | -.23 | | |
| | 4 | .40** | .33** | -.00 | |
| Total Information Handling | 1 | | | | |
| | 2 | .07 | | | |
| | 3 | -.23 | .04 | | |
| | 4 | .05 | .14 | -.06 | |
| Information Handling (Total Questioning) | 1 | | | | |
| | 2 | .33* | | | |
| | 3 | -.09 | .33* | | |
| | 4 | .35* | -.06 | .23 | |
| Information Handling (Open Questioning) | 1 | | | | |
| | 2 | .05 | | | |
| | 3 | .06 | .06 | | |
| | 4 | -.14 | .05 | .09 | |
| Total Procedure Handling | 1 | | | | |
| | 2 | .00 | | | |
| | 3 | -.14 | .36* | | |
| | 4 | -.05 | .28 | -.05 | |
| Procedure Handling (Reflective) | 1 | | | | |
| | 2 | -.02 | | | |
| | 3 | .23 | .11 | | |
| | 4 | .27 | .21 | .32* | |

*Indicates signifiance at the .05 level for a one-tailed test. Critical r with 27 df=+ .31.

**Indicates significance at the .01 level for a one-tailed test. Critical r with 27 df=+ .37.

The coefficients are largely low, and few are significant. However, there are more positive, if nonsignificant correlations than neutral or negative ones, and there is some promise of stability. Also, the subjects of the study were teacher-candidates, who may be less consistent than experienced teachers.

Medley[38] has made a very careful study of the consistency or stability of elements of teaching style as defined by categories in OScAR and FIAT (Flanders' system). Both FIAT and OScAR were employed in four observations of forty teachers. Correlations of categories across "teacher" ranged from near zero to 0.80, but were positive in most cases for both OScAR and FIAT.

Medley's analysis supports the contention that there is stability of teaching style, but that the extent of stability varies by dimensions or aspects of teaching behavior. The most stable (highly correlated) dimensions appeared to be the affective ones.

When Medley employed factor analysis to identify behavior dimensions and tested the hypothesis that those factors were reliable, he obtained the results which are presented in Table 16.

His evidence is the most convincing to date that teacher styles are relatively consistent across most dimensions of behavior.

Table Fourteen

Descriptive Data on 41 OScAR Contrasts (after Medley)

| | Contrast Name | Stability Coefficient | Mean and Range of Scores Per Visit: Mean | Lowest Score | Highest Score | Range |
|---|---|---|---|---|---|---|
| 1. | Affective Statements | .70** | + 9.9 | 0 | + 47 | 47 |
| 2. | Positive Affect | .80** | + 0.3 | - 43 | + 25 | 68 |
| 3. | Concern | .70** | - 4.2 | - 25 | + 1 | 26 |
| 4. | Hostility | .82** | - 2.9 | - 26 | + 6 | 32 |
| 5. | Pupil Talk | .77** | + 5.4 | 0 | +227 | 227 |
| 6. | Continuing Pupil Statements | .78** | + 1.6 | - 26 | +223 | 249 |
| 7. | Management | .32* | +21.2 | 0 | +126 | 126 |
| 8. | Control | .34* | +12.0 | - 56 | +126 | 182 |
| 9. | Dominance | .45** | + 2.5 | - 91 | + 47 | 138 |
| 10. | Direction Complexity | .31* | - 4.4 | - 45 | + 16 | 61 |
| 11. | Description Complexity | .20 | - 0.8 | - 17 | + 76 | 93 |
| 12. | Permissiveness | .44** | + 1.5 | - 81 | + 24 | 105 |
| 13. | Pupil Initiative (Procedural) | .35* | + 1.2 | - 18 | + 81 | 99 |
| 14. | Benevolent Despotism | .00 | + 1.1 | - 15 | + 81 | 96 |
| 15. | Teacher Talk | .77** | +26.1 | -118 | +251 | 369 |
| 16. | Suspense | .85** | - 9.5 | -270 | + 81 | 351 |
| 17. | Problem Complexity | .50** | -15.2 | - 61 | + 56 | 117 |
| 18. | Lecturing | .80** | 8.5 | - 30 | +236 | 266 |
| 19. | Teacher Initiative (Substantive) | .78** | + 5.1 | - 47 | + 51 | 98 |
| 20. | Cohesion | .66** | - 3.5 | - 48 | + 61 | 109 |
| 21. | Divergence | .58** | -21.0 | -123 | + 43 | 166 |
| 22. | Feedback | .68** | -10.4 | - 77 | + 59 | 136 |
| 23. | Valence | .78** | +15.9 | - 33 | +140 | 173 |
| 24. | Enthusiasm | .31* | -16.7 | -122 | + 19 | 141 |
| 25. | Encouragement | .62** | -19.0 | - 63 | + 17 | 80 |
| 26. | Positivity | .50** | + 2.2 | -120 | + 67 | 187 |
| 27. | Feedback by Teacher Initiative | .68** | + 0.6 | - 23 | + 33 | 56 |
| 28. | Feedback by Cohesion | .35* | + 0.1 | - 37 | + 31 | 68 |
| 29. | Feedback by Divergence | .61** | + 3.2 | - 60 | + 67 | 127 |
| 30. | Valence by Teacher Initiative | .59** | + 3.1 | - 16 | + 45 | 61 |
| 31. | Valence by Cohesion | .05 | - 1.1 | - 59 | + 55 | 114 |
| 32. | Valence by Divergence | .57** | - 6.7 | -120 | + 12 | 132 |
| 33. | Enthusiasm by Teacher Initiative | .40* | - 2.5 | - 39 | + 13 | 52 |
| 34. | Enthusiasm by Cohesion | .40* | - 5.5 | - 61 | + 13 | 74 |
| 35. | Enthusiasm by Divergence | .37* | + 7.8 | - 15 | +110 | 125 |
| 36. | Encouragement by Teacher Initiative | .72** | - 0.1 | - 22 | + 37 | 59 |
| 37. | Encouragement by Cohesion | .53** | + 1.4 | - 20 | + 23 | 43 |
| 38. | Encouragement by Divergence | .63** | + 7.4 | - 18 | + 53 | 71 |
| 39. | Positivity by Teacher Initiative | .60** | - 2.6 | - 40 | + 27 | 67 |
| 40. | Positivity by Cohesion | .32 | + 0.7 | - 23 | + 55 | 78 |
| 41. | Positivity by Divergence | .31* | + 0.3 | - 50 | +109 | 159 |

* $.01 < p < .05$

** $p < .01$

Table Fifteen

Compositions and Stability Coefficients of Variables
Scored on FIAT Records (after Medley)

| Scale No. | Variables | Name | Stability Coefficient |
|---|---|---|---|
| 1. | Accepts Feeling | Total in Category 1 | .40* |
| 2. | Praises | Total in Category 2 | .80** |
| 3. | Accepts Ideas | Total in Category 3 | .80** |
| 4. | Asks Questions | Total in Category 4 | .80** |
| 5. | Lecturing | Total in Category 5 | .74** |
| 6. | Directing | Total in Category 6 | .66** |
| 7. | Criticizing | Total in Category 7 | .71** |
| 8. | Student Responds | Total in Category 8 | .83** |
| 9. | Student Initiates | Total in Category 9 | .80** |
| 10. | Silence or Confusion | Total in Category 10 | .70** |
| 11. | Indirect Teacher Talk | Cells 11-13, 21-23, 31-33 | .71** |
| 12. | Direct Teacher Talk | Cells 66, 67, 76, 77 | .23 |
| 13. | Indirect v. Direct Influence | Variable 11, Variable 12 | .71** |
| 14. | Extended Indirect v. Direct Influence | Variables 1-3, Variables 6, 7 | .65** |
| 15. | Content Cross | Variables 4, 5 | .80** |
| 16. | Center of Content Cross | Cells 44, 45, 54, 55 | .73** |
| 17. | Extended Praise | Cell 22 | .08 |
| 18. | Extended Criticism | Cell 77 | .51** |
| 19. | Extended Questioning | Cell 44 | .68** |
| 20. | Extended Lecturing | Cell 55 | .73** |
| 21. | Extended Directing | Cell 66 | .15 |
| 22. | Elaborating Questions | Cell 34 | .84** |
| 23. | Difficult Questions | Cell 4-10 | .42** |
| 24. | Pacing | Cell 5-10 | .46** |
| 25. | Sustained Student Talk | Cells 88, 89, 98, 99 | .73** |
| 26. | Student Response Praised | Cell 82 | .77** |
| 27. | Student Response Accepted | Cells 81, 83 | .85** |
| 28. | Student Response Not Evaluated | Cells 84-86 | .72** |
| 29. | Student Response Criticized | Cell 87 | .66** |
| 30. | Student Initiation Praised | Cell 92 | .61** |
| 31. | Student Initiation Accepted | Cells 91, 93 | .67** |
| 32. | Student Initiation Not Evaluated | Cells 94-96 | .56** |
| 33. | Student Initiation Criticized | Cell 97 | .07 |
| 34. | Convergent Question | Cell 48 | .84** |
| 35. | Divergent Question | Cell 49 | .63** |
| 36. | Directed Student Response | Cell 68 | .45** |
| 37. | Directed Student Initiation | Cell 69 | .22 |
| 38. | Student Response After Indirect Talk | Cells 18, 28, 38 | .43** |
| 39. | Student Initiation After Indirect Talk | Cells 19, 29, 39 | .66** |
| 40. | Student Response After Lecturing | Cell 58 | .25 |
| 41. | Student Initiation Following Lecturing | Cell 59 | .68** |
| 42. | Silence or Confusion After Student Initiation | Cell 8-10, Cell 9-10 | .63** |
| 43. | Indirect v. Direct Following Student Response | Cells 81-82, Cells 86, 87 | .85** |
| 44. | Indirect v. Direct Following Student Initiation | Cells 91-93, Cells 96, 97 | .66** |

*$.01 < p < .05$

**$p < .01$

Table Sixteen

Summary of Results of Analyses of Variance of Scores on 15 Factor-Derived Behavior Dimensions (after Medley)

| Factor | Variable | Instrument | Hypotheses Rejected | | | | | | Reliability Estimates | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Change | Subject | Change by Subject | Teacher | Change by Teacher | Visit by Teacher | Total Scores | Total Scores |
| I | Lecturing | OScAR | * | | | ** | | | .83 | --- |
| I | Lecturing | FIAT | | * | | ** | ** | | .79 | .42 |
| II | Question Type | OScAR | | | | ** | ** | | .77 | .48 |
| II | Modified I-D Contrast | FIAT | | | | ** | ** | | .86 | .40 |
| III | Question Difficulty | OScAR | ** | | | ** | | | .49 | --- |
| IV | Student Initiations | FIAT | ** | | | ** | * | | .80 | .39 |
| V | Rebuking | OScAR | | | | ** | | | .83 | --- |
| V | Criticizing | FIAT | | | | ** | ** | * | .82 | .40 |
| VI | Listening | OScAR | | * | | ** | ** | | .80 | .82 |
| VI | Modified Content Cross | FIAT | * | | | ** | ** | | .86 | .58 |
| VII | Indirect Teacher Talk | FIAT | | * | | ** | ** | | .71 | .45 |
| VIII | Question Source | OScAR | | | | ** | | | .79 | --- |
| VIII | Student Interactions | FIAT | ** | | | ** | * | | .67 | .31 |
| IX | Permissive Behavior | OScAR | ** | | | ** | | | .50 | --- |
| X | Managing Behavior | OScAR | * | | | ** | ** | | .45 | .33 |

*.01 < p < .05

**p < .01

## Dimensions of Process

Against this background we turn to the variables which have received the greatest attention in the study of process.

### The Affective Variables

The truly procreative Anderson and Brewer[39] studies came from the orientation that dominative, punitive teacher models would be imitated by children and demonstrated in peer relations, as would, similarly, integrative patterns. The orientation came from the child-study and Progressive movements, themselves related, which were much concerned with the personality outcomes of education and which also believed that integrative social climates would have positive cognitive effects as well because the affirmed, fully-functioning learner would be more motivated and affective than a punished, dominated one.

Out of this background came the most widely-used and influential systems for analyzing teaching, those developed by Withall,[40] Flanders,[41] and Medley and Mitzel.[42] The Bales[43] system for studying the dynamics of work oriented and counseling groups also came from the same tradition.

The results have frequently confirmed the stance which first found behavioral expression in Anderson and Brewer's work.

Attitudes toward self and others are more positive in affirmative, cooperative social climates. Taken separately, affirmation and cooperativeness

have much the same effect on feelings. Models of cooperativeness and dominativeness affect learners of all ages. Social climate is contagious and produces positive attitudes as well.

With respect to cognitive outcomes, the results are mixed. Considering the other variables involved, social climate has to be taken seriously despite an uneven pattern of results.

Also, Flanders'[44] important finding that teachers who showed the greatest variability in directness and indirectness of teaching induced the greatest student learning suggests that intelligent variety in teaching increases learning. The teacher who cannot modulate from directness appears to be less effective. Medley,[45] Joyce,[46] Hunt,[47] and others have advocated this position both for theoretical reasons and from their interpretation of the empirical literature. Variability in itself emerges as a variable to be taken seriously. Furthermore, there is considerable evidence that teachers can learn to vary the directness and affirmativeness of their teaching, that is, to intentionally and intelligently modulate the degree of directiveness and affirmativeness.

It is worthwhile noting that while affirmativeness and cooperativeness are generally regarded as dimensions of social climate, they are not always correlated. In more than a dozen studies, Joyce[48] and his associates[49] have found very low correlations between affirmativeness as indicated by frequency of positive sanctions and indirectness or cooperativeness in the establishment of structure (see Table 17).

Table Seventeen

Correlation Coefficients among Indices of Teaching Styles in Total Lessons of Twenty-Nine Student Teachers Combined (after Joyce, et. al.)

| Index | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Sanctioning (Positive) | | | | | | | | |
| 2. Sanctioning (Negative | -.68*** | | | | | | | |
| 3. Sanctioning (Convergent) | .08 | .02 | | | | | | |
| 4. Total Information Handling | -.07 | -.15 | -.06 | | | | | |
| 5. Information Handling (Total Questioning) | .32* | -.31* | .26 | -.23 | | | | |
| 6. Information Handling (Open Questioning) | .31* | -.25 | -.01 | -.03 | .44** | | | |
| 7. Total Procedure Handling | -.25 | .29 | -.21 | -.68*** | .10 | -.01 | | |
| 8. Procedure Handling (Reflective) | .29 | -.35* | -.29 | -.23 | -.11 | .13 | .06 | |

*Indicates significance at the .05 level for a one-tailed test. Critical r with 27 df=+ .31.

**Indicates significance at the .01 level for a one-tailed test. Critical r with 27 df=+ .43.

***Indicates significance at the .005 level and greater for a one-tailed test. Critical r with 27 df=+ .47.

How should we categorize behavior in the affective domain?

Simon and Boyer[50] have suggested two dimensions of teacher behavior in the affective domain, Support (Affirmativeness) and Judgmentalness, to which I would add a third, Cooperativeness. They present two "generalized" category systems over these dimensions:

Figure Five

Generalized Category System
Affective Domain - Support Dimension* (after Simon & Boyer)

| Support ◄ versus ► Nonsupport | |
|---|---|
| Examples | Examples |
| Gives support (such that the receiver is not sorry he shared what he did) | Blames |
| Accepts feelings | Complains |
| Shares own, similar feelings | Attacks person |
| Expresses pleasure about what has just been said or done by others | One-ups (follows an expression of feelings with exaggerated or different expression of own feelings) |

*May be coded from verbal and/or nonverbal behaviors.

Figure Six

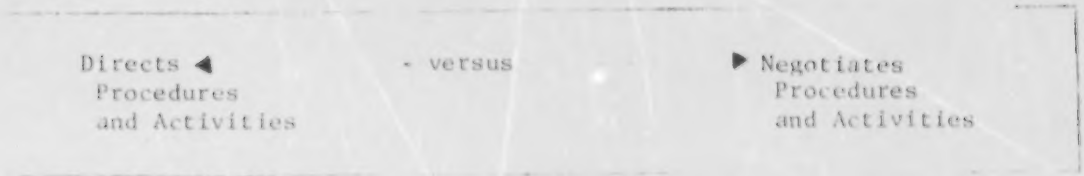
Generalized Category System
Affective Domain - Judgmental Dimension (after Simon & Boyer)

| Understanding ◄ versus ► Judging | |
|---|---|
| Examples | Examples |
| Accepts idea | Positive evaluation ("good") |
| Clarifies understanding | Negative evaluation ("wrong") |
| Reflects or paraphrases ideas | Counter proposals, suggestions |
| Expands on someone else's idea | Implies judgments (should, should never, you always, everybody ought) |

I would add the third in similar fashion:

Figure Seven

Cooperativeness Dimension




There was an understandable confusion in the early literature when an affirmative social climate was often seen as one end of a continuum with a cognitive orientation at the other end. Today, the affective dimension should be seen in terms of two variables, one anchoring on a combination of the support and judgmental dimensions, and the other on cooperativeness.

Support appears in behavioral terms when the teacher uses feedback moves to provide affirmation or disapproval to the student(corrective feedback). The utilization of student ideas by the teacher demonstrates the integration of the three dimensions.

The Cognitive Dimension

The cognitive dimension has been explored chiefly through three variables. One is the "cognitive level" of teacher and learner moves. The second is the logical character of classroom communications. The third is a continuum from

convergence to divergence in which divergence (from Guilford) is assumed to be related to the generation of productive thinking.

"Cognitive levels" have referred to the type of mental activity which is embedded in or implied by a communication. Most frequently the Taxonomy of Educational Objectives[51] has been used to define levels. Just as the Taxonomy provides a system for classifying objectives in terms of increasing complexity of intellectual activity, so questions and statements are classified on a continuum from those apparently exercising "recall" through interpretation, analysis, synthesis, and evaluation of information and ideas.

Simon and Boyer[52] have presented a generalized category system in that area also (see Figure 8).

The results of the use of cognitive levels have indicated that most teachers' questions and statements are ordinarily concentrated at the lower levels.

An important finding is that the "cognitive level of students communications is highly correlated with that of teachers. The more a teacher employs higher-order questions and statements the more students will do so." (Typically correlations between cognitive levels of teacher and student communications are 0.80 or above.)

Simon and Boyer[49] have presented a generalized category system in that area also:

Figure Eight

Cognitive Processes

| Generalized Category System* | Taxonomy of Educational Objectives** |
|---|---|
| Low Order Cognitive | Knowledge |
| 1. Data Recall | 1.00 Knowledge<br>1.10 Knowledge of Specifics<br>1.20 Knowledge of Ways and Means of Dealing with Specifics<br>1.30 Knowledge of the Universals and Abstractions in a Field |
| Data Organization Processes | |
| Higher Order Cognitive | Intellectual Abilities and Skills |
| 2. Data Processing<br>Read or Report Data<br>Collect<br>Enumerate, List<br>Group, Classify<br>Label<br>Analyze, Compare, Contrast<br>Synthesize<br>Infer, Generalize, Hypothesize | 2.00 Comprehension<br>2.10 Translation<br>2.20 Interpretation<br>2.30 Extrapolation<br>3.00 Application<br>4.00 Analysis<br>4.10 Analysis of Elements<br>4.20 Analysis of Relationships<br>4.30 Analysis of Organizational Principles<br>5.00 Synthesis<br>5.10 Production of a Unique Communication<br>5.20 Production of a Plan, or Proposed Set of Operations<br>5.30 Derivation of a Set of Abstract Relations |
| Evaluation Processes | |
| 3. Evaluation<br>Personal Criteria<br>Social Criteria<br>Pragmatic (probability) Criteria | 6.00 Evaluation<br>6.10 Judgments in Terms of Internal Evidence<br>6.20 Judgments in Terms of External Criteria |

*Simon and Boyer (1967)

**Bloom (1956)

Thus, just as students imitate and follow the lead of teachers in the affective-social dimension, so do they in the cognitive-logical dimension. In the few investigations in which teachers have been taught to vary the cognitive level of their discourse, and the treatments at different levels has been related to student learning, the learning outcomes have responded in predicted ways.(53)

Training research has consistently indicated that teacher cognitive behaviors are subject to training. Whether training has focused on specific skills, complex skills, models of teaching, or curriculum implementation, training to change cognitive levels (either by raising the frequency of higher-order communications or by increasing the ability to use same in teaching strategies) has generally succeeded.

Cognitive level continues to be a productive variable in the study of teaching.

## The Skill-Oriented Studies

The search for trainable skills has occupied much attention. Rosenshine and Furst(54) and, recently, Heath,(55) have studied research in which measures of several types of skill have been related to student learning outcomes.

The term "skill" has been used very loosely, with concepts such as "clarity in explaining," "probing behind a student's initial answer," and "enthusiasm" being grouped together.

Rosenshine and Furst[54] contended that the following descriptions of behavior showed promise (e.g., were related to some form of student learning in a fairly well-designed investigation).

Approval and Disapproval

Business-Like Behavior

Clarity

Flexibility in Questioning

Variety

Enthusiasm

Heath has challenged all of these, setting off a debate which will probably continue for some time.[55]

Is skill a part of method? Turner,[56] Joyce,[57] Weil[58] and others have contended that skills are most properly seen as parts of larger patterns of teaching (models or strategies), and that research on skills will be most fruitful when it focuses on skills which increase the effectiveness of methods directed toward particular goals.

Skill, from their perspective, increases the power of a strategy to accomplish a particular goal.

Weil[58] studied the behavior patterns of teachers practicing a variety of models of teaching and extrapolated what she believed would be cross-model or generic teaching skills. When she trained teachers to use those skills, however, skill-performance turned out to be model-specific.

Others have contended that we will, in time, identify generic skills, and the issue is far from settled.

From this perspective, effectiveness is goal-related and consists of skill in carrying out or inventing a teaching pattern or model directed toward some class of learning outcomes.

The Management Dimension

Since learning is a student activity, it is reasonable to expect that ability to manage the learning situation and persuade learners to productive activity will be an important dimension of effectiveness.

Management is likely to be affected by both method and material (e.g., good management in a programmed instructional system is likely to be different from good management in an inductive values-clarification program), and thus far there are very few cross-model or cross-curriculum investigations. Most of the studies of management have been in the context of the recitation method, where ability to keep students on-task is certainly likely to be a component of effectiveness.

Kounin[59] has done the most extensive research into classroom management and has identified a number of aspects of teaching style which are associated with the creation of a work-oriented, disruption-free classroom.

He makes plain that classroom management skills are facilitative rather than ends in themselves, but operates from the stance that unless a teacher can produce a task-oriented social system other aspects of teaching style are not likely to account for much learning.

The development of his work is instructive because it is marked by a shift in orientation about the aspects of teaching style which are management-effective.

He began with the study of the "ripple effect" of particular teacher moves aimed at reducing disruption and increasing work-orientation. He found ripple effects in simulations and small group teaching situations. (Moves aimed at one student and designed to quiet a disturbance would "ripple" and quiet other pupils also.) He concluded, however, that ripple effects were vastly reduced in the classroom and that effective discipline was probably a function of general management skills rather than "desist" behavior.

His subsequent study of management behavior resulted in the identification of aspects of management styles that are both highly correlated with each other and associated with productivity in the two activities which he found most prevalent in the classroom: recitation and seatwork.

These are:

1. Withitness and Overlapping

   These dimensions deal with a teacher's communicating that she knows what is going on regarding children's behavior and with her attending to two issues simultaneously when two different issues are present.

2. Smoothness and Momentum

   This measures how the teacher manages movement during recitations and at transition periods.

3. Group Alerting and Accountability

These techniques deal with the extent to which the teacher maintains a group focus during recitations in contrast to becoming immersed with a single child.

4. Valence and Challenge Arousal

Direct attempts by teacher to get the children more enthusiastic, involved, or curious about academic activities.

Motivational pushes could be:

a. Showing genuine zest and enthusiasm.

b. Making a statement pointing out that the activity possesses special positive valence, "This next one is going to be fun. I know you'll enjoy it."

c. Making a statement pointing out that the activities possesses special intellectual challenge, "You'll need your thinking caps for this one. It's tricky."

5. Seatwork Variety and Challenge

Deals with the teachers' programming of learning activities with variety and intellectual challenge, especially in seatwork settings.

Table 4.2 from Kounin [our Table 18] indicates the intercorrelations among the skills. The correlations indicate the existence of a general management skill of which the above are sub-skills or components, although "seatwork variety and challenge appears to be independent of the others."(59)

Table Eighteen

Intercorrelations Among Teacher Style Measures (after Kounin)

| | *Momentum* | *Withitness* | *Smoothness* | *Group Alerting* | *Accountability* | *Overlapping* | *Valence and Challenge Arousal* | *Seatwork Variety and Challenge* | *Class Size* |
|---|---|---|---|---|---|---|---|---|---|
| *Momentum* | | .499 | .745 | .294 | .385 | .404 | .268 | −.091 | −.160 |
| Withitness | | | .479 | .474 | .370 | .598 | .271 | .224 | −.097 |
| Smoothness | | | | .420 | .289 | .482 | .259 | −.037 | −.069 |
| Group Alerting | | | | | .494 | .416 | .347 | .080 | −.145 |
| Accountability | | | | | | .275 | .161 | .084 | −.076 |
| Overlapping | | | | | | | .067 | .039 | −.136 |
| Valence and Challenge Arousal | | | | | | | | .325 | −.084 |
| Seatwork Variety and Challenge | | | | | | | | | −.206 |
| Class Size | | | | | | | | | |

Seatwork variety and challenge, however, is apparently highly important in "seatwork" settings while the other skills are more important in the "recitation" activities (see Table 19).

Table Nineteen

Correlations Between Teacher Style and Children's Behavior in Recitation and Seatwork Settings[a] (after Kounin)

$N$ = 49 classrooms ($r$ of .276 significant at .05 level)

| | *Recitation* | | *Seatwork* | |
|---|---|---|---|---|
| | Work Involvement | Freedom from Deviancy | Work Involvement | Freedom from Deviancy |
| Momentum (Freedom from Slowdowns)[b] | .656 | .641 | .198 | .490 |
| Withitness | .615 | .531 | .307 | .509 |
| Smoothness (Freedom from Thrusts, Dangles, Stimulus-Boundedness) | .601 | .489 | .382 | .421 |
| Group Alerting | .603 | .442 | .234 | .290 |
| Accountability | .494 | .385 | .002 | −.035 |
| Overlappingness | .460 | .362 | .259 | .379 |
| Valence and Challenge Arousal | .372 | .325 | .308 | .371 |
| Seatwork Variety and Challenge | .061 | .033 | .516 | .276 |
| Recitation Variety and Challenge | .238 | .162 | | |
| Overall Variety and Challenge | .217 | .099 | .449 | .194 |
| Average Duration of Seatwork Activities ("Attention Span") | | | .231 | .005 |
| Class Size (Range 21–39) | −.279 | −.258 | −.152 | −.249 |
| Boy-Girl Ratio | −.132 | −.097 | −.197 | −.171 |
| Maximum Multiple $R$'s | .812 | .720 | .686 | .741 |

[a]Goodness of fit tests for the various measures of teacher style and for the measures of children's behavior showed that the distributions of scores did not differ significantly from a normal distribution curve.

[b]Intercoder agreements for the various measures of children's behavior and teacher styles ranged from 79% to 99% agreement, with an average intercoder agreement of 92%.

The high multiple R's indicate that Kounin is indeed getting a handle on management skills and, thus, on an important dimension of teaching behavior - one very likely to be associated with pupil learning when it is brought together with other aspects of teaching style.

The consistent negative correlations with class size are interesting. If class size reduces disruption does it also enable management skills to be employed? If smaller classroom sizes increase the ripple effect of "desist" moves, then. . .

Kounin may have the best evidence yet that decreases in class size may increase effectiveness - but that really large differences in size are necessary to bring about an important change.

Finally, it is possible that we may find, when investigating instructional skills, that there is an analogy to the management domain. That is, Kounin at first looked for effectiveness in specific moves. He later turned to "style" or "strategy" - to the general process of management.

Research on the substantive aspects of instruction has been concentrated on moves or quality of moves (questioning and clarity of questions, for example). It is conceivable that moves have effect only as part of the management of instruction - as part of teaching strategies. This is reinforced by the findings of the above-cited study by Weil[60] which indicated that specific skills facilitated the implementation of specific models of teaching - they functioned effectively only when they became part of a pattern.

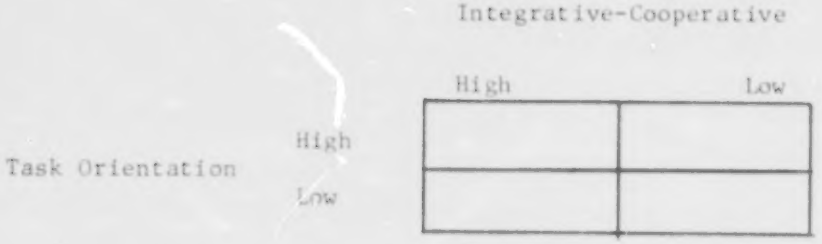
The Social System of the Classroom

Both micro-ethnology and category systems have been employed to study the social system of the classroom[61] but none of these have included student learning as a dependent variable. For that matter, there are few available typologies of the social system of the classroom which can be applied directly to effectiveness research.

It is probably worthwhile to use dimensions from the affective-social climate dimension and combine these with a dimension like "task-orientation" to generate such a typology for present work. Both dimensions can be managed with sets of categories which would permit classrooms to be classified in a two-way system as in Figure 9.

Figure Nine

A Two-Way Classification of Classroom Social Systems




The productivity of these social systems can be studied in terms of classes of learning outcomes.

Summary of Teaching Process Variables

The entire picture is one of a very large number of promising variables which may well interact with or supplement one another to boost student learning.

The affective variables, both the affirmativeness and cooperativeness dimensions, promise to affect attitudes directly and cognitive outcomes indirectly. The cognitive variables have a mixed pattern of results, but have often been examined with inappropriate learning outcomes and may function better within a method or strategy than when observed in isolation from an instructional pattern.

Skill-oriented research has had a curious pattern of findings, again, possibly, because isolated skills may not have much clinical meaning.

Kounin[62] has brought the study of management to the point where it should be brought together with the other dimensions in outcome-related studies.

Methodology for the study of the social system of the classroom is somewhat less firm, but is intriguing and may well, in a materials-oriented instructional world, turn out to reveal powerful and important dimensions of teaching style.

Part IV

## OUTCOMES, MATERIALS, AND LEARNERS

### Classes of Learning Outcomes

In both the cognitive and affective domains there are available several general ways to classify learning outcomes and a number of attempts have been made to apply these to reading and arithmetic.

The Taxonomies of Educational Objectives[63] are available in both cognitive and affective domains, the Gagné hierarchy[64] in the cognitive domain and Maslow's hierarchy[65] in the affective domain.

Williams[66] has suggested that reading outcomes fall into the following five categories:

The Content of Decoding

- Paired-Associate Learning: Gagné
- Recall and Translation: Bloom

Automatic (Rapid) Decoding*

- Principles: Gagné
- Translation: Bloom

Comprehension of Material Read

- Concepts: Gagné
- Interpretation: Bloom

Application to New Material

- Principles and Concepts: Gagné
- Interpretation and Analysis: Bloom

Positive Attitude toward Reading

- Attitude to self as reader: Maslow
- Interest in reading: Krathwohl

*There is, of course, signal learning which might also be considered in such a categorical listing.

Begle[67] has suggested a similar classification in arithmetic:

Computation and Knowledge of Basic Terms
Analogous to Decoding

Automatic (Rapid) Calculation
Analogous to rapid decoding

Comprehension of Mathematical Concepts
Analogous to Basic Comprehension of Material Read

Application to Problems

Positive Attitude toward Arithmetic

These appear to represent the most promising dependent variables for the study of effectiveness in the teaching of reading and arithmetic. All of them have behavioral referents (can be tested) and are common objectives of all the widely-used curriculum plans.

Typically, outcomes in the curriculum areas generally bear some relationship to one another. Evidence from the SMSG study indicates that subtests of various arithmetic skills and learning tend to correlate moderately with each other. However, some exhibit a high degree of independence and most are not highly correlated with verbal or nonverbal intelligence.

Reading subtests are often more highly correlated as indicated in the Bond and Dykstra study. Correlations mostly range between 0.25 and 0.70.

Typically, "decoding" subtests are highly correlated with one another as are "comprehension" and "study skills" tests, with each being somewhat less highly related to each other except in the lower grades, where decoding and comprehension are highly related.

Intelligence is typically more highly correlated with reading subtests than with arithmetic (see below).

Table Twenty

Summary of Correlations between Pre-Measures and Word Reading Test for Each of Six Treatments (after Bond and Dykstra)[68]

| | Basal | i.t.a. | Basal plus Phonics | Language Experience | Linguistic | Phonic Linguistic |
|---|---|---|---|---|---|---|
| Murphy-Durrell phonemes | .48 | .54 | .54 | .45 | .55 | .55 |
| Murphy-Durrell letter names | .55 | .60 | .58 | .52 | .56 | .67 |
| Murphy-Durrell learning rate | .38 | .35 | .39 | .29 | .44 | .48 |
| Thurstone pattern copying | .34 | .45 | .46 | .33 | .36 | .36 |
| Thurstone-Jeffrey identical forms | .29 | .36 | .40 | .29 | .29 | .38 |
| Metropolitan word meaning | .32 | .40 | .41 | .21 | .31 | .35 |
| Metropolitan listening | .22 | .31 | .37 | .17 | .23 | .31 |
| Pintner-Cunningham Intelligence Test | .44 | .52 | .57 | .42 | .47 | .56 |

Nonetheless, the omnipresent "G" factor does not absorb all the variance. Frederick Davis' [69] research cautions us that we should not even treat comprehension in an undifferentiated way. The abstract of his recent articles is to that point.

He estimated the per cent of nonchance variance of each of eight important reading comprehension skills of mature readers.

> Forty multiple-choice items, each based on a separate passage, were used to measure each skill. A differential item analysis was performed in such a way as to obtain eight uninflated biserial correlation coefficients for each of the 320 items between passing or failing the item and scores in the eight skills. Two parallel forms of twelve items each were assembled to measure each skill. These tests were next administered to a new sample of 988 twelfth-grade pupils. Uniqueness analyses were then performed, cross validated by items and, separately, by examinees. Surprisingly large percentages of unique nonchance variance were found, especially in scores measuring memory for word meanings and drawing inferences from content. It is clear that reading comprehension among mature readers is not a unitary trait.

On the other hand, the eight comprehension skills he dealt with are by no means independent as can be seen from Table 21.

Table Twenty-One

Intercorrelations of Skills 1-8 in Form C (after Davis) (69)

| Skill | 1 Recalling word meanings | 2 Drawing inferences about the meaning of a word from context | 3 Finding answers to questions answered explicitly or merely in paraphrase in the content | 4 Weaving together ideas in the content | 5 Drawing inferences from the content | 6 Recognizing a writer's purpose, attitude, tone and mood | 7 Identifying a writer's technique | 8 Following the structure of a passage |
|---|---|---|---|---|---|---|---|---|
| Within first testing session | | | | | | | | |
| Sample 1 (N = 494) | | | | | | | | |
| 1 | 1.00000 | .55656 | .46238 | .53488 | .42642 | .51916 | .60721 | .54311 |
| 2 | .55656 | 1.00000 | .57062 | .60766 | .52295 | .61946 | .64831 | .62878 |
| 3 | .46238 | .57062 | 1.00000 | .58694 | .56926 | .51989 | .61189 | .60737 |
| 4 | .53488 | .60766 | .58694 | 1.00000 | .52442 | .59886 | .66151 | .63208 |
| 5 | .42642 | .52295 | .56926 | .52442 | 1.00000 | .49824 | .53612 | .57765 |
| 6 | .51916 | .61935 | .61989 | .59886 | .49824 | 1.00000 | .67397 | .60035 |
| 7 | .60721 | .64831 | .61189 | .66151 | .53612 | .67397 | 1.00000 | .68012 |
| 8 | .54311 | .62878 | .60737 | .63208 | .57765 | .60035 | .68012 | 1.00000 |
| Sample 2 (N = 494) | | | | | | | | |
| 1 | 1.00000 | .59894 | .50513 | .53530 | .39493 | .53208 | .57606 | .52727 |
| 2 | .59894 | 1.00000 | .57204 | .62095 | .52999 | .60327 | .64119 | .61224 |
| 3 | .50513 | .57204 | 1.00000 | .49743 | .51243 | .53923 | .61021 | .56316 |
| 4 | .53530 | .62095 | .69743 | 1.00000 | .49693 | .58074 | .63079 | .56728 |
| 5 | .39493 | .52999 | .41243 | .49693 | 1.00000 | .43569 | .49044 | .55908 |
| 6 | .53268 | .60327 | .53923 | .58074 | .43569 | 1.00000 | .63758 | .57348 |
| 7 | .47606 | .64119 | .61021 | .63059 | .49044 | .61748 | 1.00000 | .64125 |
| 8 | .52727 | .61224 | .56316 | .56728 | .55908 | .57348 | .64125 | 1.00000 |

## Materials for Instruction

Materials have not generally been studied as sources of variables in the search for the effective teacher. It is apparent, however, that the presence or absence of materials, the substance they contain, the learner's ability to interact with them and teach himself, and their amenability to various teaching styles and strategies, all have a powerful effect on the process of education. As indicated elsewhere in this paper, learning materials are very much utilized in the classroom, even determining the curriculum in many cases. Also, elsewhere, we describe an experiment in which children, interacting with materials alone, achieved virtually as much as did children interacting with materials and instructors.

It appears wisest to concentrate first on the characteristics of materials and how they are used in the classroom. We suggest a system for classifying learning materials which includes two dimensions, the instructional and the media-descriptive.

The instructional dimension is taken from the traditions of the curriculum field and includes three categories:

A. Highly Programmed Individualized Materials

These are designed to be individualized self-teaching systems, with the teacher serving as a diagnoser-prescriber, manager, and facilitator. Project Plan, IPI, nad IGE are examples.

B. Interactive Curricular Materials

These employ less minutely sequenced models than the programmed ones, are suitable for group use, employ interactive or information-processing models of teaching, and generally require a more active instructional role for the teacher. Most "basal" series are largely of this type, although a "comprehensive" published program may include type "A" materials as well.

C. Resource Materials

These support teacher-learner activity but sequence it minimally if at all. The library which supports the experience-self-selection approach to the teaching of reading is one example. "Concrete materials" to support arithmetic teaching are another example.

The media-descriptive dimension is taken from Bruner's [70] 1959 classification of the three modes of instruction: the iconic, the symbolic, and enactive.

Symbolic materials are word-mediated. Verbal symbols represent concepts.

Iconic materials are pictorial, including charts, graphs, and other ways of reducing data to representation in terms of space, volume, and shape.

Enactive refers to material which permits the learner to "act out" a concept physically and mentally. In mathematics, the abacus is suitable for an enactive mode.

Putting the two dimensions together, we obtain the matrix depicted in Figure 10.

Figure Ten

Instructional Dimension

| | Programmed | Interactive | Resource |
|---|---|---|---|
| Symbolic | | | |
| Iconic | | | |
| Enactive | | | |

The differences among material types are important both for the construction of ETU's and for the au natural study of teachers, because the instructional role of the teacher varies depending on what is available to him and how he uses it.

Very little research has examined the effect of materials on teacher behavior, although teacher behavior in materials-mediated curriculums has been studied, intensively in some cases. For example, teacher behavior in IPI has been extensively studied by both the Pittsburgh Center and the Philadelphia laboratory.

Basically, however, there is very little evidence about the influence of materials on effectiveness. Is effectiveness in achieving a given objective (say, mastery of cardinal and ordinal value concepts) different with, for example, the use of Cuisenaise Rods than it is with the use of programmed modules? On the surface, it would seem so, but we don't know for sure that effectiveness varies with materials.

## The Learner

It is not at all surprising that individual differences between learners account for much variance in all classes of learning outcomes. It is learner effort which results in learning. The teacher exposes the learner to process and content, but the learner is in the powerful position and his individual differences are bound to be muscular.

Clearly, any analysis of influences on student achievement has to include socioeconomic background and intelligence because they are so much associated with achievement. Hauser's[71] 1971 report of data from Nashville indicated that intelligence is the more closely associated with achievement of the two (see Table 22).

Table Twenty- Two

Average over grades of within-school correlations among student background factors and academic achievement, white public secondary school students: Nashville Standard Metropolitan Statistical Area (SMSA),1957(after Hauser's Table 5.1)

| | V | S | F | Q | M | W |
|---|---|---|---|---|---|---|
| X | .471 | -.127 | .032 | .200 | .149 | .189 |
| V | | -.187 | .006 | .207 | .164 | .209 |
| S | | | -.015 | -.146 | -.123 | -.169 |
| F | | | | .051 | .042 | .031 |
| Q | | | | | .556 | .570 |
| M | | | | | | .640 |

Note: Item identifications are: X-Father's occupation; V-Father's education; S-Number of siblings; F-Intact family; Q-Intelligence; M-Stanford Mathematics Grade Equivalent; and W-Stanford Reading Grade Equivalent.

When he employed a path model over the data he concluded that "the outstanding feature of the path model is the powerful variable of intelligence, which practically washes out the direct effects of the other variables. With one exception, the direct effects of the socioeconomic variables are at least twice as large in Table 5.1 [our Table 22] as in Table 5.2 [our Table 23]. That is, the model suggests that the association of socioeconomic background with achievement is primarily a function of its association with intelligence and only secondarily a function of its influence on achievement by other mechanisms."(71)

Table Twenty-Three

Direct and indirect components of the association of socioeconomic background and intelligence with academic achievement, white public secondary school students: Nashville Standard Metropolitan Statistical Area (SMSA), 1957 (after Hauser's Table 5.2)

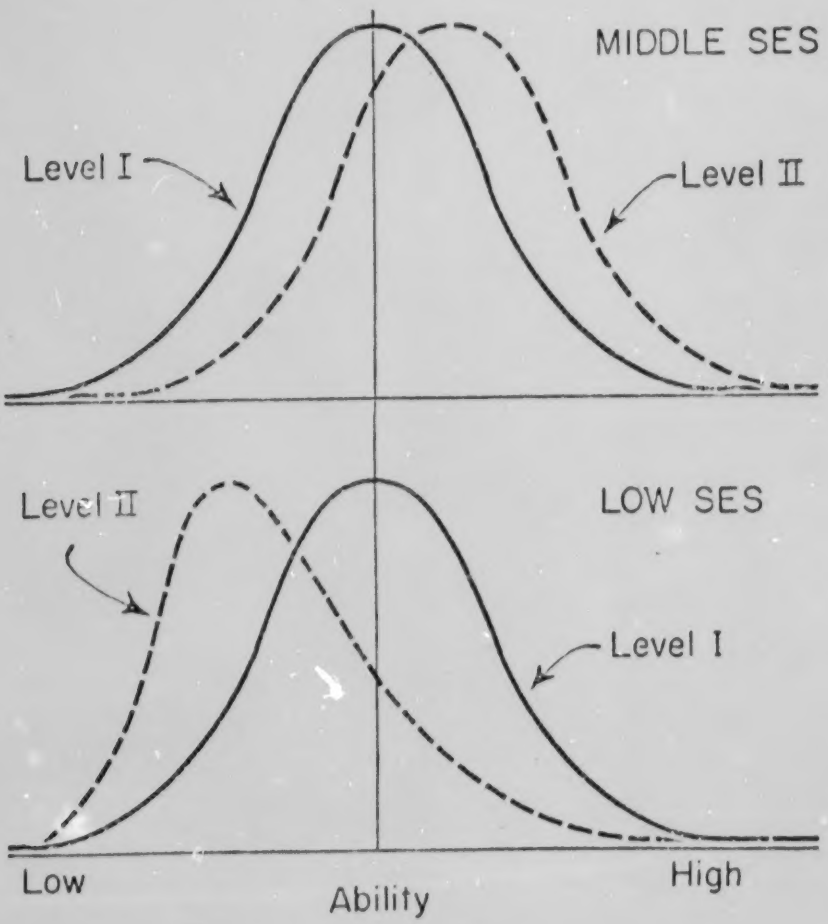
| Correlation | Effect via X, V and S | Effect via Q | Total |
|---|---|---|---|
| $r_{XM}$ | 27.6% | 72.4% | 100.0% |
| $r_{VM}$ | 31.9 | 68.1 | 100.0 |
| $r_{SM}$ | 36.0 | 64.0 | 100.0 |
| $r_{QM}$ | 3.0 | 97.0 | 100.0 |
| $r_{XW}$ | 43.1 | 56.9 | 100.0 |
| $r_{VW}$ | 46.8 | 53.2 | 100.0 |
| $r_{SW}$ | 53.6 | 46.4 | 100.0 |
| $r_{QW}$ | 5.7 | 94.3 | 100.0 |

Note: Item identifications are X-Father's occupation; V-Father's education; S-Number of siblings; Q-Intelligence; M-Stanford Mathematics Grade Equivalent; and W-Stanford Reading Grade Equivalent.

While in many studies intelligence has been treated in a unitary fashion, it may be worthwhile to distinguish between Level I (memory) and Level II (abstract reasoning) components of learning ability (See Jensen, 1969, 1972)[71] since they appear to behave differently with respect to SES.

Figure Eleven

Hypothetical distributions of Level I (solid line) and Level II (dashed line) abilities in middle-class (upper curve) and culturally disadvantaged (lower curve) populations



Level I appears to be much less affected by social disadvantage. Levels I and II may also relate differently to the several categories of learning outcomes which are proposed Conceivably, also, they may interact differently with teachers and other aspects of learning environments to produce various categories of learning outcomes. It is probable that, in fact, there are very complex interactions among SES, levels of ability to learn, and environments.

Gradually, IQ and SES become translated into achievement, and achievement becomes a powerful variable with respect to subsequent achievement. (In every curriculum area, class standing in any one year is a strong predictor of class standing in a subsequent year.) So much variance has been absorbed by individual differences that the degree of effectiveness of the teacher has been obscured. Correlational studies in particular are questionable in this area. If learner characteristics are accounting for half to three-fourths of the variance not due to error then any different variable is unlikely to emerge as a major factor.

If effectiveness is seen as helping the learner achieve more than he would have done by himself we free ourselves of some of the worst aspects of the dilemma. First, we don't expect the same "opportunity for effectiveness" with each learner. A very capable, highly-motived learner may leave little room for the teacher to demonstrate effectiveness with standard subject matter. He is a joy to teach and, in fact, probably learns much from his teacher. He generally consumes basic skills and knowledge comfortably. When he develops a learning deficit in some area, however, he becomes a great candidate for the demonstration of effectiveness, because he can respond so readily to appropriate instruction.

If we catch the teacher with such a learner at the right moment, we can observe his effectiveness more easily than when that same learner is breezing along, merrily teaching himself everything in sight.

From the point of view of the learner, then, effectiveness may be a "sometime" thing.

Outcome Classes and Learners

The more an outcome is composed of or dependent on general problem-solving ability the more individual differences in intelligence influence that outcome. Computation is somewhat less influenced by intelligence than concept learning and both are less correlated with intelligence than problem-solving in arithmetic.

This may be partly a measurement problem (How can we measure specific problem-solving ability without measuring some general problem-solving capacity?) but is very likely much more than a technical dilemma (these capacities no doubt really overlap and influence each other).

The effect of this is that it will probably be much easier to discern teaching effectiveness in achievement of the very specific skills and concepts of a curriculum area than in the more general comprehension and problem-solving domains. General, standard achievement tests, highly correlated with intelligence and cultural background, are the poorest bets. Curriculum-specific, criterion-referenced measures are more likely to demonstrate results. This is because specific criterion-referenced measures are far less susceptible to influences not related to the actual teaching process itself. Measures which tap general problem solving ability or verbal acuity do not necessarily reflect specific skill learning in teacher effectiveness, but instead can be influenced by prior training, attention span and other such confounding variables.

We could speculate that much previous research on effectiveness has been severely hampered by the use of general curriculum measures. In reading, for example, there are few group tests of specific word-attack skills, which is precisely where differences in effectiveness are likely to be most easily discerned.

The learner variable with the highest potential productivity is teachability with respect to a given outcome criterion. The teachable learner is ready for the learning tasks (it is not hopelessly difficult or mismatched with his learning style) which will boost him to the criterion but he has not anticipated the learning task by bringing himself to the criterion by another route. The learner's achievement of the criterion can be boosted or made possible by the teacher.

As Medley contends, we should try to establish links ". . .between the experiences a pupil has in the classroom and what he learns. I think we may regard as axiomatic the proposition that learning results from the activity of the learner; and if we do so regard it, it seems clear that the function of the entire educational enterprise is to arrange for each pupil to have those experiences that will maximize his progress toward the goals that society lays down for him. This is what the school should be held accountable for - for arranging optimal learning experiences for each of the pupils entrusted to its care."(72)

Part V

## THE ARRAY OF VARIABLES

The array of variables which have been explored is large, indeed, and most of them have not been systematically explored in studies of teacher effectiveness. A selective list of those discussed above is presented in Table 24 together with an indication of the instruments or types of instruments which are available to explore them.

Table Twenty-Four

Variables and Instruments or Types of Instruments Available to Explore Them

| | Variables | Instruments |
|---|---|---|
| 1. | Classroom Culture or Dynamics | Micro-Ethnology (e.g., Smith, Gump) |
| | Integrativeness | Category Systems (e.g., Flanders) |
| | Cooperativeness | |
| | Task Orientation | Bales System |
| 2. | Instructional Materials | |
| | Instructional Character (Programmed, Interactive, Resource) | Category System (check list) |
| | Mode (Symbols, Iconic, Enactive) | |

Table Twenty-Four (cont'd)

| Variables | Instruments |
|---|---|
| 3. Method | |
| Rote vs. Meaningful<br>Student vs. Teacher Centeredness<br>Expository vs. Discovery<br>Synthetic vs. Analytic<br>(Precision vs. Grossness)<br>Method-Related Tasks | Sign Systems<br>Check Lists and Ratings<br>Interaction Analysis |
| 4. Teaching Process | |
| Affective-Social<br>Affirmativeness<br>Judgmentalness<br>Cooperativeness<br>Cognitive-Logical<br>Levels of Discourse<br>Substantive-Logical | Generalized Category Systems (from Mirrors of Behavior) |
| Instructional Skills<br>Sanctions<br>Business-Like Behavior<br>Clarity | General Ratings |
| Management<br>Organizational Behavior<br>Task Orientation | Kounin's System |
| 5. Learning Materials | |
| Programmatic<br>Mode | Descriptive Ratings |

Table Twenty-Four (cont'd)

| Variables | Instruments |
|---|---|
| 6. Outcomes | |
| Decoding | |
| Automatic Decoding | |
| Basic Comprehension | |
| Application to New Material | |
| Positive Attitudes | Test |
| Computation | |
| Automatic Computation | |
| Understanding | |
| Problem Solving | |
| Positive Attitudes | |
| 7. The Learner | |
| IQ | Not dealt with specifically here |
| SES | |
| Flexibility | |
| Motivation | |
| Affiliation | |
| 8. Decision-Making Style | |
| Preactive | Clinical Planning Forms |
| Interactive | Stimulated Recall |
| Perception of Learner | Paired-Comparison |

## Part VI

## DESIGN CONSIDERATIONS AND PROMISING QUESTIONS

Although there is still no base of research on teaching effectiveness which is solid enough to be policy-amenable, there are many promising variables which have been developed conceptually, and for which some existing research technology exists. The avenues which might be taken are numerous. The course to follow is not obvious.

In this section we will present a number of considerations to be considered in shaping a strategy for research, a number of conceptions of effectiveness which might guide the strategy, and some questions which might be the focus.

### Styles of Research

Nearly all studies of effectiveness in teaching have been correlational. Descriptions of teaching behavior have been used as indicators of teaching styles or skills, and then translated into scores or ranks that have been correlated with student residual gain scores. Most of the remaining studies have employed inferential statistics. Usually, teachers associated with higher and lower gain scores have been compared in terms of ratings of teaching behavior or frequency counts or indices of behaviors. Rarely has an experimental study been employed to test hypotheses about teaching skills and learning outcomes, although several are presently in progress.

The present focus is on the identification of teaching behaviors which are stably related to student achievement and which are trainable and stabilizable by training. The chief function of this paper has been to discuss the problem of variable selection in the design of studies of natural variability in effectiveness. As each class of variables has been discussed, candidates for inclusion in a study have been nominated. Since there are many more candidates than can be feasibly elected, the problem of selection is considerable.

Both the selection of the variables and the design of the research should reflect not only the empirical evidence that particular variables may be promising but also the likely explanations about why stable effectiveness has not yet been uncovered. In other words, the design should be different from previous ones in ways likely to unmask effectiveness. The assumption should not be made that the weak findings from the past are the result of stupidity, poor design, and weak instrumentation on the part of previous investigators. As a group, other investigators know what we know about design and instrumentation and they put their professional lives into their studies. We must use the offered explanations about why they failed as carefully as we build on their instruments.

The following considerations are offered to begin the necessary dialogues.

Replication

The design should provide for replication of findings concerning effectiveness. We can expect large differences in class mean gain scores during any one period with respect to any learning outcome. After student individual differences are accounted for, some teachers will appear to be more effective than others for any one period. The design should ask the question of stability, however. Without replication, the assumption could not be made that the same teachers would be most effective a second time, given the history of past research.

Criteria

Outcomes in both curriculum areas should not be lumped together in single achievement or attitudinal scores. Because general higher-order measures are confounded with intelligence, effectiveness is most likely to be discerned where criteria are curriculum-area specific, dealing with concepts and skills which are unique to the area. The more global and general the measures, the less likely clear findings will emerge.

Synergistic Variables

The dynamics of the classroom group should be part of the study, including its "pull" on the teacher. Measures of dimensions such as cohesiveness, affirmativeness, and task orientation should be included. Many believe that stability of effectiveness has been masked by this variable.

Materials

Because much learning comes from the learner's interaction with materials and because many materials are method-specific, materials have to enter the equation. "What materials is the learner exposed to and for how long?" "What role does the teacher play in getting the learner together with materials?" are questions to be answered.

Method

Apparently many teachers are heavily dependent on method-related materials which they supplement more or less extensively. Thus, the learning tasks belonging to the methods employed heavily influence classroom behavior. In addition, many of the learning tasks are outcome-specific. The learning tasks specific to the common methods should be identified and the questions asked "Does the teacher use them?" "What is the variation in the ways teachers use them?" "What other kinds of learning tasks do teachers use?"

The inclusion of a focus on learning tasks should allow the utilization of new criterion or outcome-defined dimensions of teaching behavior. In addition, it should result in tracking more closely than before the activities of specific learners and the teachers' relationship to these learners. Finally, it should anchor all other observations of the teacher's activity to criterion-referenced learning tasks, thus permitting teacher behavior and skills observed directly as they logically relate to outcomes.

Cognitive-logical skills of the sort previously studied should be studied, but in relation to learning tasks. This should magnify the test of the hypothesis that intelligent variety in teacher behavior is an important component of effectiveness. The study of decision making should intensify the test of this hypothesis.

Nurturant skills and behavior also should be studied as before, but also anchored in descriptors of learning tasks. Their effects are indirect and can be expected to be actuarial, showing up as low correlations with all classes of outcomes.

The primary design task is to set hypotheses about what constitutes effectiveness and to make sure that the research eliminates these hypotheses if it does not confirm them.

## The Focus of Research

The focus of the research should be on the identification of skills which differentiate the effectiveness with which teachers boost the achievement of specific learning outcomes. It is not enough to learn that some teachers are more effective than others or even that some teachers perform certain tasks more effectively than others (employ specific activities better). The research must seek to learn why as well as that. This why must be expressed in terms of skills.

It is very unlikely that any small number of skills will be responsible for boosting a large number of learning outcomes. (The inconsistent findings relative to "questioning" are probably due to this.) If Medley's[73] conjecture is anywhere near the mark, then skills may be variably useful and then only when part of a larger, outcome-specific pattern or strategy. Kounin's[74] change of conception supports this notion. In his early study of management behavior he looked for specific elements of teacher behavior but changed his focus to more global dimensions of management. Hunt's[75] contention that effectiveness will be a coordination of learner, objectives, and environments reflects a similar line of thought as does my own conception of effective teaching as the appropriate use of a repertoire of teaching strategies.

If there is truth in these conceptions, then the study of teaching must include the partitioning of the act. Skills must be seen as parts of segments of teaching activities rather than as parts of an otherwise undifferentiated whole.

Where does one begin, given the alternatives and the complexities of the problem? Clearly the BTES studies should be part of a cumulative stream - they should break ground for a long process. Even an apparent breakthrough will need much flushing out before it will be on solid ground.

The focus should be on stability of effectiveness. A series of experimental teaching units should be devised to explore teaching effectiveness along a variety of types of goals in reading and arithmetic in an effort to identify consistency of effectiveness over goals. By including learner characteristics and process variables in such a study one could test additional hypotheses about effectiveness with particular types of learners, and generate hypotheses about processes associated with effectiveness. In my view, this is the most desirable option.

The following type of instrumentation should be employed:

First, a series of ETU's should be constructed over classes of outcomes so that teachers seek, several times, to achieve those outcomes with children of a variety of characteristics.

Second, a series of "molar codes" should segment both ETU and nonETU teaching-learning activities and describe materials and social behavior.

Third, the decision-making behaviors of the teachers should be studied with respect to perceptions of learners and objectives and the shaping of environments.

Fourth, a complex process-analysis system should be employed to examine the most likely candidates among the process variables.

Such a procedure should enable the following questions to be explored:

1. Is teaching effectiveness consistent (stable) across variables within curriculum areas and across curriculum areas?
2. Are process variables within teaching segments related to effectiveness?
3. Does effectiveness vary with learner characteristics?
4. Do process variables, learner characteristics, and outcomes interact?
5. Is decision-making style associated with effectiveness?

More than one research technique may be used to conduct this sort of study.

One style of research may be intensive. Certain children within the classroom are designated "target" pupils and they become the focus of all research activities. Their behavior may be carefully coded, their interaction with the teacher and other students examined in depth, and their learning thoroughly assessed with a variety of outcome measures. This intensive approach has the potential of rooting out some process variables that may deserve more attention as well as pointing up some strong learner-method interactions.

Another approach to classroom research is more extensive in nature. It regards the class as one working unit and examines the activity occurring within the classroom in total. Teacher may be separated from students, but observations and outcome measures are obtained for the whole class and analyzed at that level.

Our current state of knowledge about teacher effectiveness does not clearly indicate one approach over the other. Specific objectives and situational considerations should be the final determinants. Within the framework suggested abvoe, there is probably need for both.

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# APPENDIX A

## MOLAR AND MOLECULAR OBSERVATIONAL CODING SYSTEMS

# MOLAR AND MOLECULAR OBSERVATIONAL CODING SYSTEMS

Outlined in the following pages are two complementary systems for observing and coding classroom activity. First, are the preliminary definitions which provide the framework for a molar (or more general) description of classroom moves. A sample observation instrument and coding key follow. An example of a more detailed category system for analyzing the molecular facets of classroom interaction (from Weil, Guillion and Cole) is also included.

These two systems and their observation instruments can be used separately or in conjunction with each other. Used together, they have the potential of providing a more complete and accurate picture of classroom activity than we typically obtain.

## PART I

## CATEGORIES AND CODES:

## DEFINITIONS

### Molar and Molecular Codes: Preliminary Definitions

The molar codes are a set of miniature sign systems, that is, within each of the systems a set of signs are provided which are applied to events in the classroom.

It is proposed that seven sign systems be used to describe the flow of events in the classroom:

(1) Setting (number of groups)

(2) Concern (curriculum and other activity areas)

(3) Outcomes (an aggregate categorization of the activities according to the class of outcomes toward which they are oriented)

(3) Materials Code (describes the kinds of materials being used by each group)

(5) Teacher Posture (a description of the instructional or organizational role of the teacher with respect to any student or group of students at any given time)

(6) Student Posture (the instructional role of the student at any given time)

(7) Method-specific learning tasks (a description of the tasks in the classroom that are being engaged in by any individual or group at any given time and which are intended to promote learning specifically related to some curricular area)

Each of the molar codes utilizes a distinctive frame of reference for describing what is going on in the classroom. For each of the molar codes two kinds of definitions are important. One is that which defines the attributes of the dimension along which the code is constructed and the second is that which defines differences between the signed values along that dimension.

1. The Setting Code

The setting simply refers to the extent to which students are grouped for activities at any particular time. There are three subcodes. The first of these is the number of groups, which may vary from one, when the classroom is operating as a whole on the same activity, to a condition of total individualization. The number of groups of persons in the situation who are engaged in similar tasks, working together or in parallel, is also recorded.

Second is the size of these groups, that is, the number of people in them. Each group is signed with its number. In a class of twenty-seven there may be, for example, three groups of nine in a classroom or one group of six and 21 groups of one or all twenty-seven students may be working as individuals.

Third is pacing which refers to the extent to which the student's activity is determined by his own choices as contrasted to the extent to which materials or directions from the teacher pace what he is doing. Each group, however few or many there are, is signed according to the degree to which his activities are internally or externally paced. The setting code simply indicates how many people are working together or separately and whether their activity is internally or externally paced.

2. Concern.

The term comes from Gump's work and refers to the substantive or other activity area which is being dealt with by any individual or group. The curriculum areas include: reading, arithmetic, language arts, science, social studies, the visual arts, the performing arts, physical education, and other substantive areas.

The other activity areas may not need to be included in this study but they might be treated as a group so that the extent to which the students are occupied within the curriculum areas can be determined. Defining attributes need to be worked out for each curriculum area. Each group is signed according to the area of concern.

3. Outcomes (aggregate categorization of activity goals).

From inferences about the focus of the materials being used and the verbal transactions which occur, each group is signed according to outcome categories in the reading or arithmetic areas. These outcome categories should be made compatible within which tests are being constructed.

The outcome code is in many ways the lynchpin of an outcome-oriented investigation. If activities are classified by outcome, that is, if the amount of time which each individual spends on activities is recorded in such a way that the outcomes which are being emphasized can be identified, then a study of time on various kinds of outcome-related tasks can be accomplished. If this is done it reduces the level of inferential leap which must be taken when one seeks to establish causal relationships between the activities of the student and his achievement. It is reasonable to suspect that some outcomes are produced by indirect and others by direct means and unless activities are categorized by outcome one is in no position to know whether emphasis on certain kinds of substantive behavior is related to outcomes.

4. Materials.

Again, each group is described according to the kinds of materials with which he is engaged.

The first subcode is simply whether materials are <u>present</u> or <u>absent</u>. If they are absent then it is presumed that the learning task is carried on

by the students' independent activities or by transactions with other students and/or with the teacher.

The second code records activities in instructional style, the extent to which they are programmed, inductive, or open-ended. Programmed materials are designed to be as errorless as possible and to lead the student through a series of successive stages to a particular outcome. Inductive materials are designed to help students induce concepts of various kinds. Open-ended materials are astructional, that is, they depend on teacher or student activity and are not constructed with learning tasks imbedded in them.

The third materials code is media mode and refers to whether the material is in a print mode, an audiovisual mode, or manipulative in character.

5. Teacher Posture.

Posture is a gross descriptor of the organizational-instructional role that the teacher is playing with respect to any given learner or group. Each group is signed with the dominant posture for any given period of time. The postures are:

Director

Lecturer

Discussor

Recitator

Tutor

Monitor

Counselor

Participant

Absent

With respect to any given group the teacher posture is described according to the posture the teacher is in at the time of observation.

A director is an organizer, one who is giving directions about goals, content, process, or details of implementation.

The lecturer is a giver of information. Primarily he speaks, although he may use audiovisual devices.

The discussor attempts to induce the students to engage in discourse with him about some substance of concern or procedural issue.

The recitator operates in a question and answer manner leading the students to review material to which they have already been exposed.

The tutor is a coach, diagnosing the performance of his learner and prescribing learning tasks. He may engage in modeling to illustrate responses to tasks.

The monitor operates with reference to materials. He supervises studies which are material based. He may tutor occasionally but the tutoring is done in reference to tasks which are embodied in some kind of instructional system or learning material.

The counselor helps students to identify objectives and processes. The student comes to the counselor or may be beckoned by him. The role is basically a nondirective one however.

When the teacher acts as participant he is scarcely distinguishable from his students. He may participate in games, singing, or in cognitive activity. In any case, he is involved with the students in an activity which has previously been organized. His director-leadership role is not very prominent.

Absent needs no explanation. In a situation in which there are three or four groups the teacher is relatively absent to most of them.

6. Student Posture.

Student postures are reciprocal to the teacher postures. They describe the stance that the learner is being asked to take with respect to an activity. There are three codes. The first refers to the stance toward learning. The second refers to student off-task responses. The third refers to the extent of privateness of the activity, With respect to stance, the following postures are coded for each group or individual.

Stance

Follower

Receiver

Discussor

Translator

Tutee

Materials Tutee

Counselee

Participant

Absent

These are defined in terms reciprocal to those of the teacher posture. The follower is acting in response to a director be he a teacher or a student. The receiver is being lectured to or read to. The discussor is engaged in discourse on some substance. The translator is reading. The tutee is working with a tutor. It is a role which is not possible except in fairly small groups or in individualized settings. The materials tutee is working with materials which have properties like programmed instruction. The counselee is working with a counselor in trying to identify goals and procedures. The

participant is engaging in an activity which is more than a follower. Absent does not require explanation. Neither does inattentive. Disruptive implies that in addition to being inattentive the student is acting so as to distract others from whatever tasks or games that are being engaged in within the legitamized system.

Off-Task Responses

Inattentive (signed only when the student wanders from the assigned or agreed-on task)

Disruptive (signed when the student distracts others)

Privateness refers to the extent to which an individual is working privately by himself, is engaged in a public interactive situation as in a discussion, or is in the position of being a public showman or reporter.

7. Method-specific tasks - A system for coding teaching tasks which are related to specific methods for teaching reading and arithmetic.

The category system which follows was generated after an analysis of eight reading and arithmetic textbook series for the elementary grades and the literature on methods for teaching reading and arithmetic. It does not always follow the language which is used in those series or in that literature but is based on concepts which were formed following the analysis.

Its intended function is to provide further ways of classifying the activities which are carried out by teachers and children in the classroom and which are intended to increase pupil learning. The assumption is made that methods for teaching reading and arithmetic generate tasks which come

to life in classroom environments and which are likely to affect learning. Thus, it provides another way of classifying the activities of the classroom to determine whether their occurrence related to pupil learning. Furthermore, it provides a way of determining whether teachers who use particular "series" actually follow the types of tasks which are prescribed in those methods-based materials, and in combinatiion with molecular coding provides a way of looking at the dynamics with which the tasks are carried out. The method-related system is designed to be a part of the molar code system identified above. As in the case of the other molar code items the observer makes the determination about each of the types of tasks and sign time periods with the appropriate codes. The assumption is made that there may be one or more classroom groups and that they may be working on different method-related tasks. In that case more than one code may be used unless all the groups are working on the same type of task.

Figure 1 presents an overview of the dimensions of the method-related tasks or activities.

FIGURE 1

Method-Related Tasks or Activities

I. Goal Identification Tasks

| | Individual | Group |
|---|---|---|
| Directed | | |
| Non-Directed | | |

II. Materials-Procurement Tasks

| | Individual | Group |
|---|---|---|
| Directed | | |
| Non-Directed | | |

FIGURE 1 (cont.)

III. Information-Processing Tasks

| | | Reception | Discovery |
|---|---|---|---|
| Orientation | Identification | | |
| | Conceptualization | | |
| | Generalization of Principles | | |
| | Judgments | | |
| | Opinions | | |

IV. Structuring Tasks

| | Content | Method |
|---|---|---|
| Directed | | |
| Non-Directed | | |

Goal-Identification Tasks. Goal-identification tasks are those which either communicate goals to students or help them formulate their goals. The coding dimension is fairly simple. It utilizes the directed-nondirected dimension which is so familiar in methods research and the setting, that is whether an individual is being addressed, or a group. Students, for example, working in an IPI setting with a teacher and analyzing a diagnostic test and determining what activities to engage in would be primarily involved in an individualized but directed goal-identification task. A group selecting a story over which to build a play would be dealing with a group nondirected goal-identification task.

Materials Procurement Tasks. Materials procurement tasks are those which relate to the assemblage of materials for some kind of activity. In a research unit, for example, students organize themselves to fan out to the library and identify books to read. Again we use the dimensions directed or nondirected and the setting codes individual or group.

Information Processing Tasks. These are tasks which cause students to work over material and to think about it at some level. In a reading group, for example, a teacher may ask students questions about their comprehension of a story in the hope of inducing conceptualizing activity. Two dimensions of information processing tasks are described. One is the cognitive orientation or levels of the tasks. These proceed from identification tasks to conceptualizing tasks to generalizing ones, judgments, and hence, to opinions. The analogy of this type of sequence of tasks ot Bloom's Taxonomy of Educational Objectives is by no means coincidental.

The second dimension is that which proceeds from reception to discovery. Reception tasks are those in which the student is to receive materials, whether from the teacher or from learning materials. Discovery tasks are those where he is led to induce a concept or to find materials on his own. At the identification level of orientation, for example, a reception task presents to the student a method for adding an inflective ending to a word, whereas a discovery task presents to the student a number of inflected and uninflected endings and leads him to generalize about changes from the singular, plural, and so forth.

Structuring Tasks. Structuring tasks are those which deal with the creation of activities. In the experience method, for example, nondirective methods are used to help students identify content that will be studied and the methods that they will use. Two dimensions are used to describe structuring tasks. One of these is the directed-nondirected dimension and the other is the distinction between content, that is the substance in question, and method, or the process which will be used to arrive at it. In the example given above the teacher may take the students to the bakery and then direct that the content of an experience story be developed out of that experience. The method of writing the content, however, he may leave to the students. Working with highly-structured material such as the Sullivan readers, most teachers would be expected to use directive tasks with respect to both content and method. On the other hand, in a self-selection reading program students work under nondirected conditions to select the books they will read (the content they will deal with) whereas they may be required to have conferences and therefore part of the method may be directed.

It is believed that these four sets of tasks adequately describe probably 60 to 70% of all of the tasks which are described in reading and arithmetic series. Beyond this level of categorization of tasks, methods become quite idiosyncratic and it is probably not worthwhile to generate a category system which will capture all of them. A micro-ethnological approach would be better suited to any attempt to capture completely all of the events of any given method.

CODING KEY

| SETTING CODE | CONCERN (Gross) | OUTCOME CODE | MATERIALS CODE | TEACHER POSTURE | STUDENT POSTURE | METHOD-SPECIFIC TASKS |
|---|---|---|---|---|---|---|
| 1. Number of groups<br>2. Size of groups<br>3. Pacing:<br>Internal (I)<br>External (E) | 1. Curriculum area:<br>Reading (R)<br>Arithmetic (A)<br>Language Arts (LA)<br>Science (S)<br>Social Studies (SS)<br>Visual Arts (VS)<br>Performing Arts (PA)<br>Physical Education (PE)<br>Other (Ø) | 1. Level:<br>Gross Outcome Category (A)<br>Sub-Category (B)<br>Item-Specific Category (C) | 1. Absent (A) or Present (P)<br>2. Errorless (E) or Inductive (I) or Open (O)<br>3. Print Mode (P) or A-V Mode (AV) or Manipulation Mode (M) | 1. Director (D)<br>Lecturer (L)<br>Discussor (DI)<br>Recitor (R)<br>Leader (LE)<br>Tutor (T)<br>Monitor (M)<br>Counsellor (C)<br>Participant (P)<br>Absent (A) | 1. Follower (F)<br>Receiver (R)<br>Discussor (D)<br>Translator (T)<br>Tutee (Tu)<br>Materials Tutee (MTu)<br>Counselee (C)<br>Participant (P)<br>Absent (A)<br>Inattentive (I)<br>Private (Pr)<br>Public Interactive (PI)<br>Public Showman (PS) | 1. Public Reading (PR)<br>Private Reading (PrR)<br>Concept Attainment (CA)<br>Concept Formation (CF)<br>Dictation (D)<br>Role Playing (RP) |

A-15

MOLAR UNIT

| TIME (minutes) | SETTING: no. of groups | SETTING: size | SETTING: pace | CONCERN (Gross) | OUTCOMES | MATERIALS | TEACHER POSTURE | STUDENT POSTURE | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |
| 30 | | | | | | | | | |

PART II

TEACHERS COLLEGE

SKILLS AND STRATEGIES

INTERACTION ANALYSIS SYSTEM*

(Teachers College Columbia University)

Behavioral Objectives: At the end of this module, the reader should be able to:

1) Define the 19 categories and 9 subscripts of the I A System.
2) Identify a "thought unit" in a written transcript and in verbal interaction.
3) Use the I A System to record verbal interaction in the classroom.

* This system was prepared by Marsha Weil, Chris Gullion, and Diane Cole and supercedes the "Conceptual System Manual" or "Joyce System" developed earlier by Bruce Joyce.

## I. STRUCTURING

### A. Planning

| Goals and Standards | | Content | | Procedures | |
|---|---|---|---|---|---|
| Directive | Negotiated | Directive | Negotiated | Directive | Negotiated |
| 1 | 2 | 3 | 4 | 5 | 6 |

### B. Implementation

| Instructional | non-Instructional |
|---|---|
| 7 | 8 |

Subscripts*

| | |
|---|---|
| 1. data | 6. summarizing |
| 2. cuing | 7. reflecting |
| 3. redirecting | 8. integrating |
| 4. clarifying | 9. non-verbal |
| 5. justifying | |

## II. INFORMATION

| Level 1 | Level 2 | Level 3 | Open | Opinion |
|---|---|---|---|---|
| 9 | 10 | 11 | 12 | 13 |

## III. FEEDBACK

| Positive | Neutral | Negative | Corrective | Repeat | Digression |
|---|---|---|---|---|---|
| 14 | 15 | 16 | 17 | 18 | 19 |

* May be used with Information Processing (9 - 13) or Structuring (1 - 8).

I. Structuring

Structuring communications are those which set and maintain the general framework within which a classroom activity takes place. Decisions which set the goals of the activity, its substantive content, its relationships to past and future learnings, and how it is to be studied are Planning moves. Those which shape their nonverbal, non-Information Processing behavior during the instructional activity are Implementation moves. More detailed descriptions follow:

A. Planning: These are moves which plan a classroom activity prior to its actual occurrence. The teacher may make all of the decisions (directive planning), or she may negotiate with students on any or all of the aspects of planning (negotiated planning). These decisions set the objectives and standards of performance (the expected outcomes), the substantive focus, the nature of the task, and the details of "who" and "how." Such planning may go on at the beginning of a lesson and/or in phases or steps during the lesson.

1. Goals and Standards: These moves decide the expected outcomes of a classroom activity, such as the product, the behavioral objective, the standard of achievement or proficiency, and the criteria which will be used to evaluate outcomes. May be either directive (1)* or negotiated (2).

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*Refers to coding number.

2. Content: These moves set the context of the lesson within the ongoing work of the class, in terms of prior and future instructional activities, and determine the substantive focus of the activity being structured. May be either directive (2) or negotiated (4).

3. Procedures: These moves set the details of "who" and "how." For example, dividing a class into teams for a spelling bee, giving directions for a worksheet exercise, describing the procedure in a concept attainment game are all procedural planning moves. Included in this category are the negotiations, which may go on at some length, when students are given the opportunity to decide how they want to go about studying a given content area. May be either directive (5) or negotiated (6).

B. Implementation: These are the moves which direct student behaviors while a classroom activity is going on. They are distinguished from Planning moves in the immediacy of the response expected. For example, a teacher who says: "After you've finished your math, line up at the door," is planning. One who says: "Line up at the door," is implementing. There are two kinds of implementation moves, Instructional and non-instructional.

1. Instructional implementation moves (7) are directives which control the use of instructional materials ("Open your books") or the behavior of students for purely instructional purposes ("Now, look at this chart"). It does not include those instructional directives which call for cognitive activity, such as the use of

manipulatives in math, the drawing of a graph, writing a poem, or classifying data nonverbally, through the use of symbols drawn on the blackboard (stars, triangles, etc.). These are coded as Information Processing at the appropriate levels.

2. Non-instructional implementation moves (8) are directives intended to maintain the social environment of the classroom, by enforcing the norms or rules for group and individual behavior ("Sit down and be quiet, please." "Get in line."), and to maintain the classroom as a physical environment. ("Would you clean the blackboards, Peggy?" "Open the window.")

II. Information Processing

Information Processing moves generate and manipulate data through interactive teaching, either verbally or nonverbally. Data are used here to include all kinds of information related to a substantive focus, from facts to concepts to theories to opinions and feelings. Information which is used in order to plan an instructional activity ("We can get cardboard at the dime store") is coded as procedural planning. Such an interchange may shift from planning to information processing if the substantive focus shifts from using the information to plan, to the information itself.

A. Cognitive Levels:

1. The Factual level (9): The cognitive processes at this level are recalling, identifying, enumerating, describing, and translating information from one medium or mode to

another (e.g., written to spoken, iconic to symbolic). The assumption is that data are not manipulated, interrelated or transformed in any way at this level, but is given or used as given.

2. The Conceptual level (10): Cognitive processes at this level are those which interrelate pieces of data in order to compare and/or contrast, to draw cause-effect inferences, to interpret data (for example, what the shape of a curve means, what the implications of an author's symbolism are), to apply what is given of general knowledge to a problem-solving situation, and to form concepts.
3. The Theoretical level (11): This is the level at which concepts and facts are generalized and synthesized into a larger theoretical structure (how the concept of international economic interdependence relates to the workings of a capitalist economy), and at which problems are creatively or synthetically solved. Other cognitive activities at this level include hypothesizing, developing criteria, and making judgments of value ("good" or "bad," "important" or trivial," e.g., in literature, political policy, ethics), and the creative process (e.g., writing original poetry, composing a piece of music, designing an experimental study). In all of this, it is assumed that the thinker has taken data given or remembered and manipulated and transformed them to the point at which theoretical structures become the focus, rather than the actual facts.

B. Other Categories:

1. Open (12): This category is used to code questions or statements whose source or intent in terms of cognitive processes cannot be determined. Included in this category are those questions which are phrased so generally that they do not define adequately what kind of information the teacher is seeking ("Can you tell me anything about ...."), and those statements which are muddled, incomplete or so oblique that cognitive level cannot be determined. The redirected question "anything else?" when it occurs within the context of a series of redirected questions, is coded at the cognitive level established by the first question of the series. If the first question is left open, each subsequent redirection is also open, that is, the exact nature of data being discussed has not been established.

2. Opinion (13): Statements or questions which express personal opinions or personal prejudices (i.e., judgments whose source and justification are personal or subjective rather than objective or empirically derived or related to the substantive focus of a lesson) are coded as opinion. Should a lesson focus on experience-based content, the interaction is coded as Information Processing at the appropriate levels, and not as opinion. Statements which evaluate cognitive or non-cognitive behavior positively or negatively are coded as feedback. Their function as reaction is more important than as subjectively-based information.

III. Feedback

Feedback moves react (to use Arno Bellack's* term) to instructional and non-instructional behaviors in the classroom and thus set the effective quality of the class (positive/negative), serve as "road signs" to the individual, letting him know where he stands, and verbally evaluate his behavior or intellectual performance.

1. Positive (14): This is a move which indicates that a verbal or nonverbal behavior is acceptable, appropriate or correct and which may also indicate the degree of correctness, etc. Such feedback ranges from "yes" or "right" to "That's a very interesting idea," or "You're doing a fantastic job on sets this week."
2. Neutral (15): This is used to code short, relatively noncommittal reactions (frequently unconscious or habitual) which indicate more that the communication was heard and understood than anything else. Examples are "um hum," "yeah," "okay." May be mildly positive in tone, but also may be used when the speaker wishes to make a response but withhold any evaluative comment at that point.
3. Negative (16): The opposite of positive feedback. Comments in this category may range from a simple "no" or "wrong" to the more strongly evaluative "That was stupid" or equivalents.
4. Corrective Feedback (17): Corrective feedback is a qualified response to another's behavior, indicating to the other that he is often off the track or out of line, without making an evalua-

*The Language of the Classroom (New York: Teachers College Press, 1966).

tive comment about that fact. A teacher may respond with "Well ...." or "Not quite," or by supplying the correct answer, or by simply saying "You've made a mistake." Should not be a punishing move. Students give corrective feedback when they say, "I don't know" or when they correct another student non-punitively.

5. Repeat (18): Used to code repetition of another's communication. For example, a teacher sometimes repeats a correct answer; in effect underling it, or she may habitually repeat everything students say. Students sometimes repeat a teacher's communication (such as a correction of pronunciation).

IV. Digression

Digression (19) is used to code interactions which stray from the substantive focus of a lesson and from the instructional or non-instructional planning and implementation which keep a class organized and moving through classroom activities. A child's observation that today is her birthday in the midst of a discussion of urban problems is a digression. Interruptions of a lesson, by the supervisor, by an outside party, by an unforeseeable event (fire drill, for example) should be noted as an interruption, and coding resumed when it ends.

V. Coding Units and Symbols

We use Taba and Elzey's definition of a "thought unit" as a heuristic in defining coding units:

"Thought unit" was defined as a remark or series of remarks expressing a more or less complete idea, serving a specified function, and classifiable according to a level of thought.*

In this system, a "coding unit" is defined as a verbal or nonverbal move expressing a generally complete idea, serving a single function (as defined by the 19 categories above), and spoken by a single speaker to a single audience. Every change of "idea," function, speaker and/or audience calls for a new coding entry.

Communications are coded as teacher question or solicitation (TQ), teacher statement (TS), student question or solicitation (SQ), and student statement (SS), plus the appropriate category number (e.g., teacher statement directively structuring content, TS3, student asking factual level question, SQ9), and subscript if appropriate.

Note that the subscripting categories 1 - 9 may be used with both Structuring and Information Processing moves (categories 1 - 13). A subscript is indicated by the addition of any number 1 through 9 after the category number (e.g., teacher redirecting a factual level question, TQ9.3; student giving justification for a negotiated procedural suggestion, SS6.5).

VI. Subscripts

There are 9 subscripts which define the kind of move being made by teacher or student, interns of instructional or logical function. They may be used to describe in functional terms any of the behaviors in categories 1 - 13.

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*"Teaching Strategies and Thought Process," by Hilda Taba and Freeman F. Elzey, reprinted in Ronald Hyman (ed.), Teaching: Vantage Points for Study (Philadelphia: J. B. Lippincott, 1968), p. 447.

1. Data moves serve to generate information, through recitation, through discussion, or through lecture. These are straightforward solicitations seeking information or statements giving information, and would normally be the initial move in an information processing cycle of questions and answers which could pass through clarification, cuing, reflection, justification, and integration on the way to the establishment of a piece of data as part of the general knowledge. The information need not be facts from memory — a concept or theory is a data input as well. Student responses to Cuing, Data, and Redirecting moves are normally coded as Data.

   Examples of Data moves:

   a. T: So, Linda, do you know what the concept is?
      S: Animals.

   b. T: What is one thing you could say about these blocks, Glen? One thing.
      S: Well, some are blue.

   c. T: Christian, why do we brush our teeth?
      S: To make your teeth clean and to keep us from getting cavities.

   d. T: Can you describe to me now what order they're in?
      S: The whole one's first, then they took a little bite, and they took another bite on the side, and then they bit it all.

2. Cuing moves are instructional moves which pull a student toward an expected response by asking leading questions or giving hints. This may be done by rephrasing a question, or breaking it down into less comprehensive parts. The object is to maximize the student's chances for making an acceptable contribution in discussion or recitation. Responses to cues are normally coded as Data.

Examples of Cuing:

a. T: What's that word? What's the first letter?

b. T: There's a mother in a family and there's also a ....
S: Father.

c. T: How did Michael feel about the trip?
S: I don't know.
T: Do you remember what he said to his mother that day?
S: Oh yeah ... he said he's really miss the gang and everybody.
T: So how do you think he felt?
S: Sad.

3. Redirect: This is an instructional move which is used to keep the ball rolling by directing the same question to a series of students, thus pulling contributions to a discussion from a number of participants, or by directing a series of students in the same instructional activity. The original question or direction is left implicit and a short question such as "Anything else?" or "Next" or the calling of names is used.

Examples of Redirect:

T: What are some of the other things from the reading?
S: It has stories.
T: Stories, okay. Anything else?
S: And buildings.
S: Apartment houses.
T: Okay. Anything else in the city?
S: Cars.
S: People.
T: Anything else?

4. Clarification moves are logical or instructional moves which solicit or provide information which facilitates understanding of a communication. Clarification moves may work at any of three levels of gap in communication. (1) They may be instructional moves which bridge a simple "didn't hear" problem, with a simple repeating or rephrasing of the communication not understood. (2) A clarification move may serve to bridge a semantic

gap, as in "I didn't understand you." This is an instructional move which responds to an incomplete or confused communication (coded as Open) or to a statement in which key words are omitted, undefined, or unfamiliar, making it impossible for the listener to feel confident that he knows what the speaker just said. The response to such a move would normally be a communication rephrasing the previous statement, defining terms, or giving examples in order to make the meaning clear. (3) A clarification move may be used to clarify both for teacher and student the logical meaning of a previous communication. This is an exchange responding to "What did you mean?" Again, it would be a rephrasing, a defining of terms, or a set of examples. Responses to clarifying moves are coded as clarification.

Examples of Clarification:

a. T: What do you mean, from other countries? (TQ9.4)
S: They're from the countries like, um, villages, um, like say in California there's a village .... (SS9.4)
T: Oh, you mean from the country. (TS9.4)

b. T: What? I'm sorry ... would you be quiet over there. Say it again, Sandy. (TQ6.4)
S: I said, I don't think I can finish this. (SS6.4)

c. S: What does that mean? (SQ9.4)
T: L'ancien regime? The old rule, it's French ... used to refer to an old order of things, the government of France before the Revolution. (TQ9.4, TS9.4)

5. Justifying moves are logical moves which seek or give criteria or evidence to support a previous data input. Such a move would most commonly occur in a situation in which there is room for disagreement over the accuracy or reasonableness of a previous assertion --

that is, it would be most likely to occur at the conceptual or theoretical level of Information Processing or over material based on personal experience or opinion, or during the Planning phase of a lesson. A response to a Justifying move would normally be coded Justify also.

Examples of Justifying moves:

a. T: So, Linda, do you know what the concept is?
S: Animals.
T: Animals. Why do you think the concept is animals?
S: Because I see mostly everything animals.

b. S: I disagree. I don't think we have to abandon this planet. People have died from cancer before we even knew what it was. Now they're dying from cancer and they know what it is. People die from pollution. A long time ago they didn't know what it was.

c. S: Why would you have to enforce an issue that would cause someone to want to live?

6. Summarizing moves are instructional moves which solicit or supply a review of what has just occurred by listing the events or inputs. The intent behind such a move is simply to gather together the data in order to refresh the memory of those involved. It may be the concluding move in a lesson, summarizing what transpired (the questions asked and answered, the steps in the process, the decisions made). A response to a Summarizing question is normally also coded as Summarizing.

Examples of Summarizing moves:

a. T: Okay, let's change our approach now and look at the things that we listed on the board. Okay. Greg, eyes up here. Creepy. Quivering. Lively. Mysterious. Fog comes into the city. Pattern of rhyme. Unrhymed. Smooth. Soft. Shoes. Velvet. Snow isn't noisy. Happy. Dreamy. Snow. Cat. Walking in snow. Okay. What things can go together?

b. T: We have four ideas. We have a robot, a television set, a radio, and a record player. Which one would you like to play with, work with?

c. T: O.K., maybe we'll just review this then. The arteries pick up ... are filled with blood and they pick up the blood from the lungs, the heart pumps the blood to the rest of the system and in the blood you have oxygen, and the oxygen gets delivered to all the rest of the body, and the veins bring it back to the lungs so you can pick up more oxygen. Am I right on that?

7. Reflecting moves are an integrative discussion skill. They pull teacher and student together into a mutual consideration of what has just been said and done, and in effect, raise the consciousness of all involved of what has happened and where they stand.

Examples of Reflecting moves:

a. T: Are you saying that everything we've done so far has been on the wrong track?
S: Well ... I guess so. I think we're missing something important.

b. T: Yes, I was thinking ... you know, you brought up the enforcement problem. And the group seems to think that perhaps going back to a less complex life would solve the problem ....

c. S: ... and when people are at that survival state I think there's something about individual needs which you have acculturated to that will put you into dire confrontation ... you know, like the ones with the most power are the ones who are going to enforce ....
S: You're saying then, that there's a vicious circle.

8. Integrating moves are also an integrative discussion skill; they are used to integrate disparate realms of thought or conversation, and to pull the discussants toward or away from a particular aspect of the content which is the subject of that lesson. A teacher may refocus a student's attention by asking a "How does that relate"

question, or by such comments as, "That brings us back to ...." or "This is connected to something else." It broadens the scope of the subject matter under consideration, even as it directs discussion and moves to integrate the various facets of the content focus of a lesson. Responses to Integrating questions or statements are coded as Integrating.

Examples of Integrating moves:

a. T: That's a good point. Can you relate that to what we were saying earlier about the circulatory system?

b. T: Yes, I was thinking ... you know, you brought up the enforcement problem. And the group seems to think that perhaps going back to a less complex life would solve the problem. And I think ... doesn't that bring up the enforcement question again?

9. Nonverbal: Used to code cognitive activities in the classroom which are not verbalized but which are the focus of instructional interaction, such as role-playing, pantomiming, working with manipulatives, drawing a graph, or writing on the chalkboard.

## TRANSCRIPT TWO

T: Okay, boys and girls...Now, I'm going to put a word up here on the board.../ two words, as a matter of fact./ I wonder who can read these two words?/

S: (much noise)/

T: Boys and girls, anyone who disturbs the lesson and the learning of the other children will have to leave./ Okay, Bianna, what are these words?/

S: Equal and same./

T: Okay./ Equal and same./ Boys and girls, who knows what these words mean?/ Charles.

S: Um...that...um...they're in order and...um.../

T: Okay./ You're on the right track./ For example, if I had a set and I do one-to-one correspondence, I find out, are these sets the same?/ Yes? Are these sets equal?/

S: Yes./

T: Yes./ That means there are the same number of elements in each set./ Okay, Charles, you may stand, because you are leaning back on your chair./ Stand up./ Okay, now boys and girls, I'm going to put another.../

S: (much noise)/

T: I'm going to put another set of words on the board./ Who knows what this word is? and this word?/ Hands, please./

S: (noise)/

T: Hector, do you want to stay in this room, and have this lesson?/

S: No./

T: Okay. You may go and sit in Mr. Barrel's class./

S: And have this lesson?/ Yeah.

T: Then let me see you sitting quietly./

S: I thought you were saying after school and staying./

T: Okay, you misunderstood me./ Who knows these words I put on the board? Okay,

Darlene, what is the first one?/

37.
S: Unequals./

38.
T: Unequals./

39.
S: And "not the same"/

40. 41. 42.
T: And "not the same."/ Okay, what do these words mean?/ When a set is unequal, when two sets are unequal, what does it mean? Rhonda?/

43.
S: It means they're not the same./

44. 45. 46.
T: It means they're not the same./ For example, here are two sets./ Annette, what must I do to find out if these sets are equal?/

47.
S: (indistinct reply)/

48. 49. 50.
T: Almost./ One-to-one correspondence./ Okay. I do one-to-one correspondence./ 51.
What do I find out about these two sets, Annette?/

52.
S: Um.../

53.
T: Are they equal?/

54.
S: No.

55. 56.
T: They are unequal./ Are they the same?

57.
S: No./

58. 59.
T: They are not the same./ Okay, boys and girls, the good witch thought you learned this so well...the good witch from mathland./.that she's going to teach you an 60. 61.
even bigger word to say out...to mean the same thing./ When we say to sets are equal.../

62.
S: Don't kick me.../

63.
S: I'm not kicking you./

64.
T: Um.. Now there seems to be a general not paying attention in the classroom. I see pencils up. I see people's heads away from the board./ This isn't how we 65. 66. 67.
learn./ Now boys and girls, I'm going to teach you a new word./ When two sets are equal, or are the same, they are also <u>equivalent</u>./ E-quiv-a-lent./ Everyone 68. 69.
say that, boys and girls./

70.
S: E-quiv-a-lent./
71. 72.
T: Bianna, pay attention./ When two sets are the same or equal they are.../
73.
S: E-quiv-a-lent./
74. 75. 76.
T: Look at that./ We have three ways of saying the same thing./ Now, if two sets are not the same, or unequal, they are non-equivalent./
77.
S: Non-equivalent./
78. 79.
T: Non-equivalent./ So we have three ways to say they are not the same./ Okay, 80. 81.
boys and girls, now this is what I want us to do./ Now, you must follow me 82.
very carefully so we learn./ Charles, you know how to take your chair back./ 83. 84.
It looks like I may have to send someone out of the room or in the back./ Yes, Charles?/
85.
S: Can I do it in the back?/
86. 87.
T: Yes./ Okay, turn your papers over and put your fingers on box number one./
88. 89. 90.
Box number one./ Now the questions reads.../ I want you to do it only as I tell 91. 92.
you./ "Are these sets equivalent?"/ Next to the word equivalent I have the word... what, class?/
93.
S: Equals./
94. 95. 96.
T: Equals,/ because equivalent and equals mean the same thing./ So are these sets 97. 98.
equivalent?/ Are these sets equal?/ What's the first thing you must do to find out if these sets are equivalent or equal? Hector./
99.
S: One-to-one.../
100. 101.
T: One-to-one correspondence./ Okay, everyone do one-to-one correspondence/ and 102. 103.
write the word yes or no on the line, and then put your pencils down./ Do 104. 105.
one-to-one correspondence/ and put your pencils down./ Okay, what did you find 106.
out?/ Are these sets equivalent? yes or no?/
107.
S: No./
108.
T: Hands./
109.
S: (several students) Yes...no...yes...yes...no...no.../

110.
T: Rhonda./
111.
S: Yes./
112. 113.
T: Wait./ Does anyone agree with Rhonda?/
114.
S: (several children) No./
115.
T: Okay, what answer did you get, Bianna?/
116.
S: No./
117. 119. 120.
T: No./ They are non-equivalent. How come...What did you find out?/ Were there elements that had no partners?/
121.
S: Yes./
122. 123.
T: Yes./ How many?/
124.
S: Two
125.
S: Three/
126.
S: (several students, some saying two, some three)
127.
128.
S: No.
129. 130. 131. 132.
T: Rhonda!/ Two elements without partners./ Which is bigger?/ Annette, which set is bigger?/ Set A or B/?
133.
134.
S: Set B./
135.
T: Okay, so the answer to that question is "No."

Name Transcript Two

Subject Math

Date 1970-71

Model Non-model

Size of group

Age

COMMUNICATION

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|---|---|---|---|---|---|---|---|
| 1. | TS 7.1 | 26. | SS 12 | 51. | TQ 12.1 | 76. | TS 9.1 |
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| 4. | SS 12 | 29. | TS 8.1 | 54. | SS 9.1 | 79. | TS 9.6 |
| 5. | TS 8 | 30. | SQ 8.4 | 55. | TS 9.1 | 80. | TS 5 |
| 6. | TQ 9.1 | 31. | SS 8.1 | 56. | TQ 9.1 | 81. | TS 7.1 |
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| 19. _____ | 44. _____ | 69. _____ | 94. _____ |
| 20. _____ | 45. _____ | 70. _____ | 95. _____ |
| 21. _____ | 46. _____ | 71. _____ | 96. _____ |
| 22. _____ | 47. _____ | 72. _____ | 97. _____ |
| 23. _____ | 48. _____ | 73. _____ | 98. _____ |
| 24. _____ | 49. _____ | 74. _____ | 99. _____ |
| 25. _____ | 50. _____ | 75. _____ | 100. _____ |

TRANSCRIPT FOUR

1.
T: (opens with a review of the procedures for this lesson...yes represents the concept...nos are not the concept...they are to look at each exemplar and describe it.)/

2. 3. 4.
T: Okay, so, Tony, want to read this one?/ So. everybody../.you can come up if you 5.
can/t see./ Okay, read out loud./

6.
S: "Hark to the whimper of a seagull;

He weeps because he is not an eagle;

Suppose you were, you silly sea gull,

Could you explain it to your she gull?"/

7.
T: What can you say about it?/

8.
S: It rhymes./

9. 10.
T. Somebody said that./ anything else?/

S: (Inaudible)./

12. 13.
T: Maybe./ Maybe we should go to the next one./

14.
S: Can I read the next one?/

15.
T: Carl, will you come up here?/

S: "And when I saw all the humans staring at the animals, I would I could be an insect, not an animal."/

17. 18.
T: Okay./ What can you say about that one? Anything?/

19.
S: Humans and animals.../

20. 21. 22.
T: Okay,/ anything else?..//Anything else?...Linda?/

23.
S: No./

24.
T: Nothing?/

25.
S: No./

26.
T: Stanley, want to say anything?/

27.
S: Can I read the next one?/
28. 29.
T: Wait./ Randy, want to say anything about this one?/
30.
S: (inaudible)./
31. 32. 33. 34.
T: Ronnie, want to say anything about this one?/..Willie?/..Romanita?/..Want to say anything?/...Randy?/You sure you 35. don't want to say anything about this one?/
36.
S: No./
37. 38.
T: Okay./ Remember this represents a concpet. An idea to find what the concept is. So we have to talk about each one, okay?/ So, Tony, did you...?/ 39. Oh, you.../ 40.
41.
S: The concept.../
42.
T: Linda...you know what the concept is?/
43.
S: Animals./
44. 45.
T: You think it's animals?/ Why do you think it's animals?/
46.
S: Because I see mostly everything animal or human./
47. 48.
T: Why is this/...Like, show me...which one?/
49.
S: Dog...(inaudible)/
50.
T: Show me where you see all animals.?
51.
S: Dog, here...and this one...oct.../
52.
S: Octopus./
53.
S: I know./
54.
S: You do not./
55. 56. 57.
T: What do you see?/ Come over here...you can come over here./ What do you see on there?/
58.
S: Bird.../
59.
T: Um hmm./
60.
S: Seagull.../
61.
T: Um hmm./
62.
S: Insect.../

T: This one?/ Well, this is a no, remember?/

S: (inaudible)./

T: Okay./ This is a no...and we're talking about an animal, right?/

S: Um hmm./

T: So what happens to that concept?/ I mean, can it be the concpet I'm thinking of?

S: Yes./

S: But there's a doggie.../

T: It's a no/...Well, it's two different sentences...I just separated them/And they're both nos. See this one's about a dog, right? And he's an animal. But it's a no, and this is a yes, and it's about animals./ So can the concept be animals?/ Or what do you think?/...What do you think, Tommy?/...Do you think it could be animals?/She said it could be animals, and it looks like to could be animals.../

S: It could be, but it seems like both of them have a little mixture of animals.../

T: Um humm./ So what does that do to animals as a concept?/

S: Animals is the whole idea, I think./

T: You think so?/ What about this one where it's a no?/

S: Well...I...I think all of them have...uh...you know...animals./

T: Uh...okay, this is a yes, right?/

S: Um hmm./

T: Which means it represents the concept./ Is that right?/

S: (several talking at once) A human being's an animal...he might be taking drugs... (inaudible)...

T: That's true./ But see this one.../

S: An animal./

S: It all has to do something about...(inaudible)/

T: You mean like...well...like he said that an animal...a human is an animal./ And that's true./ But this one is a no, Randy./

S: It has a dog.../

Name [illegible] Subject _____

ID _____ Social Process _____

Size of group _____ Name of coder _____

COMMUNICATION

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|---|---|---|---|---|---|---|---|
| 1. | TS 5 | 26. | TQ 12.2 | 51. | SS 9.1 | 76. | TQ 10.1 |
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| 5. | TS 9.1 | 30. | SS 12 | 55. | TQ 12.1 | 80. | TS 10.2 |
| 6. | SS 9.1 | 31. | TQ 12.3 | 56. | TS 8 | 81. | SS 17 |
| 7. | TQ 12.1 | 32. | TQ 12.3 | 57. | TQ 9.1 | 82. | TS 15 |
| 8. | SS 9.1 | 33. | TQ 12.3 | 58. | SS 9.1 | 83. | TQ 10.8 |
| 9. | TS 1.7 | 34. | TQ 12.3 | 59. | TS 15 | 84. | SS 10.1 |
| 10. | TQ 12.3 | 35. | TQ 12.3 | 60. | SS 9.1 | 85. | TQ 10.4 |
| 11. | SS 12 | 36. | SS 12.1 | 61. | TS 15 | 86. | TQ 10.2 |
| 12. | TS 15 | 37. | TS 15 | 62. | SS 9.1 | 87. | SS 10.5 |
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| 14. | SQ 7 | 39. | TQ 12 | 64. | TS 9.2 | 89. | SS 9.1 |
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| 21. | TQ 12.3 | 46. | SS 10.5 | 71. | SS 10.1 | 96. | SS 12 |
| 22. | TQ 12.2 | 47. | TQ 12 | 72. | SS 17 | 97. | TS 9.2 |
| 23. | SS 12 | 48. | TQ 10.5 | 73. | TS 12 | 98. | TS 14 |
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| 2. _____ | 27. _____ | 52. _____ | 77. _____ |
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| 18. _____ | 43. _____ | 68. _____ | 93. _____ |
| 19. _____ | 44. _____ | 69. _____ | 94. _____ |
| 20. _____ | 45. _____ | 70. _____ | 95. _____ |
| 21. _____ | 46. _____ | 71. _____ | 96. _____ |
| 22. _____ | 47. _____ | 72. _____ | 97. _____ |
| 23. _____ | 48. _____ | 73. _____ | 98. _____ |
| 24. _____ | 49. _____ | 74. _____ | 99. _____ |
| 25. _____ | 50. _____ | 75. _____ | 100. _____ |

Episode Four

Synectics

T: Let us begin by describing what a friend is. Can you tell me something about a friend. What do you know about a friend? Anything that comes into your mind.

P: A friend helps you; he's someone who likes you.

T: Um hmm. Anything else - Michael what do you think a friend is? Somebody who's nice; somebody who likes you.

P: He plays with you.

T: He plays with you. We're going to write a story together about a friend. Who can give me the first idea?

P: A friend is nice. A friend is good to you. A friend doesn't fight.

T: Well, let's get one idea. A friend is nice. What was your idea, Cathy?

P: That's what I said.

T: Elliot, what is your idea?

P: I forgot it.

T: Who else has an idea? Arthur?

P: I said that a friend is good.

T: A friend is good. So we have two ideas now. Who can think of another one - Elliot?

P: You are usually glad that you've got a friend.

T: All right. You are usually glad to have a friend. Cathy, did you have an idea?

P: Umm

T: We have one more idea. Help me Cathy.

P: Some friends play with you a lot.

T: Some friends play with you. All right, can someone read this whole story that we wrote?

P: A friend is nice. A friend is good. You are usually glad to have a friend. Some friends play with you.

T: Right. All right now that's a very nice story, but today we're going to see if we can learn more about a friend by making different kinds of comparisons. Remember about comparisons. Who can think of a machine that reminds them of a friend? What machine could you compare a friend to?

P: A robot.

T: O.K. What else? Any other ideas?

P: A television.

T: All right. Another idea.

P: A radio. A record player.

T: We have four ideas. We have a robot, a television set, a radio and a record player. Which one would you like to play with, work with?

P: A robot.

T: Robot? Everybody like that? All right, who could describe a robot to me? Cathy.

P: Well, sometimes he's metal and he uh.

P: He's usually made out of tin.

P: Yeah, and uh he's sort of like a mechanical man, except he's made of tin and he sort of walks awkwardly.

T: Um hmm.

P: And he's made of tin.

T: All right.

P: And he can't bend at the knees. He doesn't have any knees.

T: What else could you tell me about a robot?

P: Uh, he has no brain.

T: Has no brain.

P: And he has a square head and batteries.

T: He has batteries?

P: Um hmm.

T: What else do you know about, hm hmm.

P: He works by electricity.

T: Anything else you know about a robot? Have you ever seen one?

P: Yeah.

T: What did it look like?

P: It had a square head.

P: And it had a pointed nose like

T: Um huh, what did it do?

P: It walked.

T: What did it say, Cathy? Did it say anything?

P: It said a lot of funny things.

T: Like?

P: Umm. His mouth doesn't open. He talks from his stomach.

T: All right, now I'm going to ask

P: He's all made out of squares.

T: He's made out of squares?

P: Yeah, he has no circles.

T: You mean there's nothing round on his body; it's all square. O.K. All line. Now I'm going to ask you to be the robot. Stay in your seat, all right. Can you be it in your seat? I'm going to ask you

to be the robot. Tell me about yourself. Be the thing. Who can tell me something about themselves?

P: I - am - from - Mars.

T: All right, you are from Mars. Any other ideas about yourself?

P: My spaceship has rocks.

T: Um hmm. There you are, you

P: I am old and I am rusty.

T: You're old and rusty. Any other ideas about yourself? Tell me about your

P: I am shiny and new.

T: Um hmm, shiny and new. Any other ideas?

P: I am all square.

T: What do you do Mr. Robot? You're all circles. What do you do Mr. Robot?

P: I work for people.

T: Um hmm, what else do you do?

P: I help people.

P: I work in the circus.

P: I keep people company.

T: What else do you do?

P: I walk all around the world.

T: All around the world?

P: Um hmm.

P: I cannot swim.

T: Um hmm.

P: My planet is Mars.

T: How do you feel Mr. Robot?

P: Fine.

T: How else do you feel?

P: I feel that it is not fair for me to be made of tin and other people are made of a special kind of skin.

T: You don't like being made of tin? What else can you tell me about your feelings?

P: We don't have fingers. Other people do; they have fingers, and we hardly can pick anything up.

T: You don't have fingers?

P: Also, we can't cry cause we don't have any tears so we can't show that we're crying. We can only cry inside.

P: We can't move our heads.

P: We cannot bleed.

P: We cannot blow our nose.

P: We cannot let our hair blow when it's windy.

T: Your hair doesn't blow when it's windy.

P: We do not have any hair. We are bald.

T: Tell me something that you do.

P: We don't have a heart.

P: We don't have a brain.

P: We don't have bones.

P: We don't have blood vessels.

T: Um hmm.

P: We don't have cells.

P: We don't have tissue.

P: We don't have ears.

T: Do you have any good feelings? Have you ever had a good feeling about

being a robot?

P: I think that it's nice that you can, that we can talk like everybody else, and it's nice that we can move a lot of things.

P: I'm glad we're alive.

T: Do you remember when we talked about picking two words that fight each other?

P: Yeah.

T: Can you think of anything about the robot two words - any two words that fight each other? That you said if you like it then read what

P: Off and on - we have a little box and when we talk it goes off and on.

T: Um hmm, can you think of another, any other

P: Up and down.

T: How is that?

P: Cause he can go up and down.

P: Back and forth.

T: Um hmm. Can you think of any other two words?

P: Feeling

T: About his feelings, pardon?

P: No, feelings

T: Oh, we're talking about Mr. Robot. Something that you said about Mr. Robot. Do you want me to read what you said?

P: Yeah.

T: All right. You said you don't like being made of tin. You don't have umm, you can't cry because you don't have tears, you don't have eyes, you can't blow your nose, you can't blink your eyes, your hair doesn't blow in the wind, you don't have a bone and you don't have hearts and you don't have blood. It's nice to talk about a lot of things, you're

glad to be alive, you're from Mars, you're old and rusty, you're shiny and new, you're all square and you're all circles, you work for people and you help people. Is that enough; does that help you pick two words that fight each other? Can you think of two words?

P: Doing and not doing.

T: Um hmm, anything else - doing and not doing.

P: Helping and not helping.

T: Um hmm. All right some of the words that you said, you know the two words that fight each other are back and forth, up and down, off and on, helping and not helping. Which one would you like to work with? Back and forth, up and down, off and on.

P: Up and down.

T: Everybody like that? All right, we'll work with up and down. Now can you think of anything that you could describe by the words up and down?

P: A rocket, a bird - it can fly up and he can go down on the ground.

T: Any other ideas?

P: A ball.

T: Um hmm. Now we have three.

P: A dog cause it can jump up and down.

T: All right, we have four.

P: A kangaroo.

T: A kangaroo.

P: And a rabbit.

T: We have six ideas. I think that's enough. Let's choose one of these. We have a kangaroo, a rabbit, a dog, a ball, a bird and a rocket Which one shall we choose?

P: Kangaroo - dog - kangaroo - dog - dog.

T: All right, three people say dog; is that all right with you if we work with dog? Hmm?

P: O.K.

T: Try it, all right? Now tell me everything about a dog in terms of the words off what was it - up and down. Tell me everything about a dog in terms of those two words. How is a dog up and down?

P: He can jump up and down when he barks.

T: He barks - what else about a dog that's up and down. How would you describe a dog being up and down at the same time?

P: All the time he jumps.

T: Yes, he jumps right. What else could you say?

P: He jumps when he's excited.

T: Jumps up when he's excited.

P: He sits when he begs.

T: He's down when he begs.

P: He sits.

T: He sits. What else

P: He jumps up when he does tricks.

T: Um hmm. What else. Tell me all the things about up with a dog.

P: He's in the circus and he is in a trapeze

P: When he jumps over the ball, he's up in the air.

T: Um hmm.

P: When he chases a ball, he runs along too.

T: Um hmm.

P: He blinks sometimes.

T: Is that up - does that have something to do with up and down?

P: Un huh, cause up

T: Ohh, the blinking of the eyes up and down. Anything else that you can think about a dog. What about

P: His mouth goes up and down.

T: Yes.

P: That's what I said.

T: Right, can you think of something about a dog now in terms of down? What do you think about a dog and the word

P: He's down most of the time in a nap.

T: What else can you think

P: When he's sleeping, he's down. He's not up.

T: What else can you think

P: When he's sleeping, his eyes are closed and they're down.

T: What else can you think about a dog when he's down?

P: He's resting.

P: He's tired.

T: All right. Now, some of the things that you said about a dog when he's up and down are that he jumps up and down, he barks and his mouth goes up and down, he jumps up when he does tricks; sometimes he's in the circus and he's up on a trapeze; he jumps over the ball and he's up in the air, he blinks and his eyes go up and down; he's down on the ground when he's sleeping and when he's tired and when he's resting. Now remember when we started to talk today, we started to talk about a friend - remember? Can you think of anything that you said about the dog and up and down that you could also say about a friend?

P: A friend can jump.

T: With this thinking about all the things from up and down and the dog, what would you - that you could say about a friend. Connect it now to

a friend. What can you think of to say? Remember the ideas about a dog that you said and up and down. What would you like to say about a friend?

P: A friend is nice, and a dog is nice.

T: Right, remember when we talked about the dog and being up and down and all the things we said about the dog. Now let's see if we can think of some of those ideas about the dog in terms of the friend. What can you think of?

P: A dog can be a friend.

T: Right, a dog could be a friend. What else could you say about a friend? What else could you think of now about a friend? Do you get any new ideas about thinking of a friend?

P: Going into your house and playing.

T: What else?

P: You can go on trips together.

T: Um hmm.

P: Sleeping over with someone special.

T: Right, remember some of the things you said about being a robot and being a dog. Can you think of any of those ideas in terms of a friend? What did you say about some of the things about a robot or about a dog that you can also think about in terms of a friend? Anybody have any ideas? Umm? Nobody? Shall we write another story now about a friend.

P: Yeah.

T: All right and with some new ideas, let's see what we can write.

P: A friend is a flower.

T: A friend is a flower?

P: Yes.

T: A friend is a flower. Tell me about a flower. Elliot.

P: Well, it has petals.

T: Um hmm, what else?

P: And it's pretty.

T: Um huh. What else about a flower?

P: It grows out of the ground.

T; Um hmm.

P: It's pretty.

P: It smells good.

P: It's beautiful.

T: It's beautiful. Can you tell me anything that you've said about a flower that you could also say about a friend?

P: They're sweet.

P: They're pretty.

T: A friend is sweet and what?

P: And pretty.

P: And beautiful.

T: Spell pretty, anybody know how to spell pretty?

P: P-r-e-t-t-y.

T: P-r-e-t-t-y and beautiful. Anything else that you could say about a friend?

P: He's a partner.

T: A friend is a partner.

P: A friend is your buddy.

T: A friend is your partner and buddy. Any other ideas about a friend? Who would like to read this story for us? All right, Cathy.

P: A friend is a flower. A friend is sweet and pretty and beautiful. A

friend is your part

T: Partner and

P: Partner and buddy.

T: All right boys and girls. That was really very nice. Did you have a good time?

P: Yes.

T: Thank you very much for coming.

P: Is that all?

T: That's it.

APPENDIX B

DECISION-MAKING: STUDIES OF PREACTIVE AND INTERACTIVE DECISION-MAKING AND A MODEL OF THE TEACHER AS DECISION MAKER

# DECISION-MAKING:

# STUDIES OF PREACTIVE AND INTERACTIVE DECISION-MAKING

# AND A MODEL OF THE TEACHER AS DECISION MAKER*

## Studies of Preactive and Interactive Decision Making

The distinction between preactive and interactive decision making dates from Philip W. Jackson's 1965 paper, "The Way Teaching Is,"(1) in which Jackson distinguished between decisions made prior to the act of teaching, i.e., curricular and instructional decisions, and interactive decision making, those millions of decisions that teachers make during the act of teaching.

The literature relative to both preactive and interactive decision making is relatively sparse, with the bulk of studies in the former area. Popham, Baker, and their associates have found that without specific

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1. Philip Jackson, The Way Teaching Is (Washington: National Education Association, 1965).

* Excerpted and revised from "Teacher Behavior in the Organizational Domain," by Janet Crist, Ronald Marx, and Penelope Peterson, submitted to NIE, August 20, 1974.

training very few teachers establish behavioral objectives that are tied closely to either instructional activity or evaluation devices.(1) Popham and Baker have also developed systems for training teachers to discriminate among and select behavioral objectives, to select appropriate learning activities, and to relate their choices to evaluating devices; and they have demonstrated many times the effectiveness of these systems in affecting teachers' capability to do those things. Aside from Popham and Baker's work, there have been very few studies of preactive decision making. Joyce and Harootunian, studying teachers in elementary school science, arrived at much the same conclusion as Popham and Baker: that is, that very few teachers use a behavioral analysis as they prepare their lessons, and that most depend heavily on instructional materials for selection of method, content, and sequence of activities.(2)

There are virtually no reported studies of teachers' interactive decision making. That is to say, we know very little in any scientific sense about the kinds of information or cues that teachers use when making decisions. We have not even developed major categories for classifying the acts of decision making that we know must go on regularly in the course of teaching. Louis Smith's very careful "micro-ethnography" of an inner-city classroom explored decision making as the process of establishing the social system of the classroom.(3) His findings support the stance that much of the teacher's conscious efforts are related to the development of a coherent social system in the classroom with a defined flow of activities and a clear normative structure. Kounin's studies indicate that the social dimension is as much in the

1. James W. Popham and Eva Baker, Establishing Instructional Goals (Englewood Cliffs: Prentice-Hall, 1970).
2. Bruce Joyce and Berj Harootunian, "Teaching as Problem-Solving." Journal of Teacher Education, 15 (4), 1964, 420-427.
3. Louis Smith and William Geoffrey, The Complexities of the Urban Classroom (New York: Holt, Rinehart, and Winston, 1968).

teacher's thoughts as in the activity-structure and must be given equal prominence in research on decision making, although he did not study teachers' decisions as such. (1)

Much research, therefore, must go on to identify clearly the kinds of decisions that teachers make in the course of the act of teaching and the types of information they have as they make decisions. That is not to say that teachers presently are optimal decision makers but that we must determine what types of problems they perceive and try to solve and whether styles of problem solving are related to the teaching act and to pupil learning.

Also, a picture of teachers' decision making practices needs to be constructed in order to lay the groundwork for training. For example, training teachers to perceive and solve new types of problems is likely to require different methods than training teachers in order to improve their ability to solve problems they already perceive and have solutions for.

It is possible to conduct this research both naturalistically and by conducting a broad screen through which to view decision making. A model could be imposed on data relative to teacher's "naturalistic" decision making behavior in each of the three role settings. The results could provide information or at least ideas on how to construct training research that will lead to improved effectiveness in teachers' decision making.

The Teacher as Decision Maker: Generating a Model

The initial investigations of teachers' decision-making ought to be studies of teacher's "natural" preactive and interactive decisions. The purpose is to develop a "map" of decision making and to generate instruments

1. Jacob Kounin, Discipline and Group Management in the Classroom (N.Y.: Holt, Rinehart, and Winston, 1970)

for studying it efficiently and comprehensively. The "map" should identify types of problems teachers solve and the styles and strategies they use to solve them. It should include the kinds of information they use, its sources, and its accuracy. It should make possible a comparison of teachers' decision-making styles that is composed of descriptions of the problems teachers solve and the methods they use to solve them. Relationships between decision making and interactive teaching styles can then be determined, and both can be explored to see if they are related to pupil learning in the socioemotional and cognitive domains.

The primary data in the early studies should be protocols of teachers planning "out loud" and of stimulated recall "debriefings" in which teachers view tapes of teaching episodes and discuss the reasoning involved in their interactive decisions. These protocols would then be analyzed to determine the categories of problems teachers solve and the types of information they use as they adapt to the three roles.

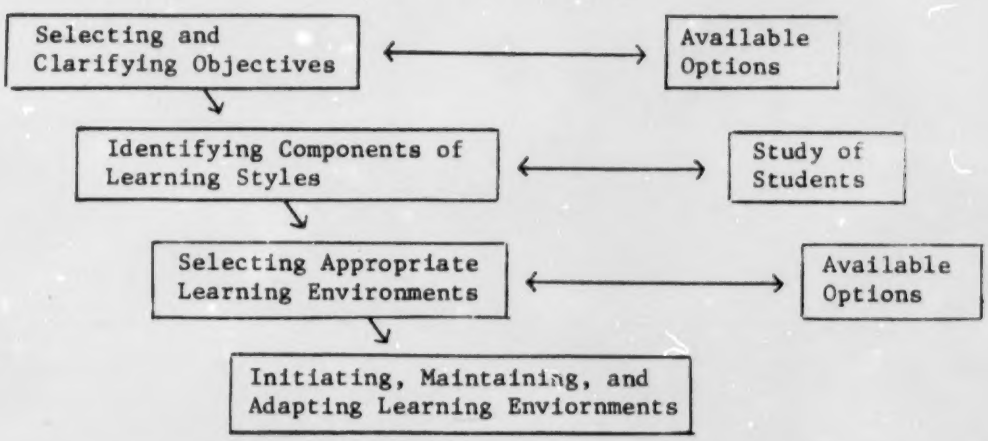
To make the analysis it is necessary to project the types of decisions which teachers make against a background of carefully thought out categories representing a theoretically optimal pattern for making decisions. As the two ways of describing problem solving--the one generated by natural teacher activity and the other by a theoretical construct--are matched against each other, a basis for improving decision making through training can be generated. Part of the basis will be rooted in an empirical determination of which teacher decision-making behaviors are or appear to be associated with effective teaching, and part will originate in components of the theoretical structure.

## A Model of the Teacher as Decision Maker

One theoretical model is generated from two perspectives--that of Hunt and his associates [1] and that of Weil. [2] Hunt has speculated that the teacher's primary complex of skills is in "radiating" environments that are appropriate to different educational purposes and differences between learners. Thus viewed, decision making in teaching is a matter of identifying, selecting, and coordinating educational objectives, student characteristics, and environments. It involves selecting and modifying objectives, discriminating between learners in terms of important characteristics of their learning styles, and selecting environments which are likely to be optimal for the objectives to be achieved and the characteristics of the learners (see Figure 1). From this stance, interactive teaching skills become those necessary for generating and maintaining the selected environments and adapting them to the responses of the students.

Figure 1

A Network of Teaching Decisions




1. David Hunt, "Adaptability in Interpersonal Communication Among Training Agents," Merrill Palmer Quarterly, 1970, 16, pp. 325-344.
2. Weil, op. cit.

Using Information about the Learner

Hunt's model (see "Teachers' Adaptation to Students: From Implicit to Explicit Matching")states that optimal decision making requires the teacher to obtain information about the learning styles of his students, to select environments appropriate to their styles (a function belonging to pre-active decision making), and to modify them during teaching to adjust to student responses (a function of interactive decision making).

For our purposes, the important questions are:

(1) How do teachers perceive their students? What are the ways in which they utilize the information about students that they gain in the course of their teaching?

(2) How do they relate their behavior to their perceptions both of student characteristics and of student responses to the acts of teaching?

(3) What are the dimensions which teachers might use to perceive their students more clearly and how can they be taught those dimensions?

(4) How can teachers use information about their students to coordinate educational environments at the preactive level and to modify them at the interactive level?

Research in this area must begin with the clarification of the dimensions that teachers presently use to perceive their students. Schroeder and his associates have done a preliminary investigation of the dimensionality with which teachers view students, and this work needs to be extended to clarify the types of categories they use. (1) The next step is to conduct a series of training experiments that can determine how to teach teachers to employ potentially useful dimensions of their students and to incorporate this new information into their preactive

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1. H. M. Schroder, M. Karlins, and J. Phares, Education for Freedom (New York: Wiley, 1973).

and interactive decision-making acts. (It is highly probable, for example, that teachers can only utilize two or three dimensions of information about students at any one time.) The initial goal is to learn how accurately teachers perceive the cognitive and affective characteristics of their students and the cues used by the more and less accurate teachers. This can be followed by an investigation to determine how teachers use information about the learner so as to arrive at their selection of environments or teaching strategies.

Selecting and Generating Educational Environments

Hunt's model suggests that the selection of learning environments should be coordinated with objectives and with learners (i.e., matched to the learning styles of the students). Once an environment has been selected the teacher uses his skills to bring it into existence, maintain it, and adapt it to the responses of the children.

Joyce and Weil have provided a framework which describes and compares many of the available educational environments. They refer to these as "models of teaching," the specifications of a range of educational strategies. (1)

The available models of teaching can serve a research program which focuses on organizational behavior in several ways:

1. They provide a description of available environments that can be compared with what teachers naturally provide for students, thus allowing a systematic analysis of the environments teachers select.

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1. Bruce Joyce and Marsha Weil, Models of Teaching (Englewood Cliffs, N. J.: Prentice-Hall, 1972).

2. They provide a framework for training by identifying a range of teaching strategies that teachers can learn. The effects of knowledge of a clinical competency in models of teaching on the preactive decision-making behavior of teachers can then be investigated.

3. They provide guidelines to interactive decision making. Training in specific models should affect interactive decisions when those models are being employed. For example, some models specify shifts in cognitive operations at certain stages (from collecting data to classifying it, for example). In so doing, they help the teacher make decisions about when to ask questions of certain kinds, when to institute particular types of activities, and so on. They help identify many of the decisions which have to be made and the bases on which to make them. Models also can sensitize the teacher to particular characteristics and responses of the learners and guide him in modulating activities, structure, questions, etc. to the learner. (See Hunt and Weil for a fuller explanation).

4. Instructional models provide guidelines for the use of teaching skills in much the same way that they guide decision making. For example, they help the skillful questioner to make deliberate use of his questioning ability so as to maximize the impact of the skill. They help the skilled negotiator know when, what, and how to negotiate with his students.

Once the act of teaching has commenced, a teacher employs his skills to bring about a given educational environment (i.e., implement a particular teaching strategy). As he teaches he receives information

about his students and must make judgments about the appropriateness of their responses in the situation. He must then interpret that information and decide how to modulate his behavior in order to adapt the environments to the students. The process of implementing an educational environment and adapting it are accomplished by the exercise of appropriate teaching skills.

Models of teaching built around theoretically derived educational environments provide maps of the skills that might be employed. They also provide a description of the range of educational environments that are available to a teacher after he has clarified objectives and is preparing to teach. Weil's position paper "Teaching Skills and Models of Teaching" provides a preliminary analysis of the skills required to implement a variety of models of teaching responsively. This paper provides a framework for determining how teaching models or strategies can function to guide interactive decision making by helping the teacher know <u>when</u> to employ particular skills and <u>how</u> to modify environments by using his skills to shift emphasis. In addition, the paper can be used to generate hypotheses about the relationships between teaching and decision making. Potentially, for example, teaching skills and decision-making strategies will be interdependent. (Without a repertoire of skills, many environments may be out of reach to the teacher. Reciprocally, without adequate decision making, teaching skills may well not be optimally employed.)One could attempt to learn how those models of teaching can function to guide teachers' employment of skills and how the repertoire of skills functions in decision making. At the interactive decision-making level, one could attempt to learn how knowing different

models of teaching can assist interactive decision making by providing guidelines to the use of skills and to making environments responsive to learners.

Where to Look for Effects on Pupils

We would not expect that the sheer ability to clarify educational objectives would have a powerful effect on student achievement, although Popham has shown that it can have some effect.[1] We would not expect that more accurate perception of the students would function by itself to bring about greater student learning. Nor would the possession of a repertoire of teaching skills be likely, by itself, to be assiciated with pupil outcomes. However, once a teacher is able to clarify objectives, select appropriate environments, bring them into existence, and coordinate them with the characteristics of his students, then we can examine whether that complex of competencies will result in greater pupil learning of various kinds. Thus the pupil learning which is measured needs to reflect the actual processes of decision making that go on. Through several stages of research it needs to be learned how teachers formulate objectives and guide their activities during interactive teaching, and whether that process can be improved. As those stages are accomplished one could increasingly expect to look more precisely for the effects on learners. If, for example, a teacher (1) decides to teach a given set of concepts, (2) perceives his students' cognitive development accurately, (3) selects a strategy that is appropriate both to the teaching of concepts and to the cognitive level of those students, (4) has the skill to bring that environment into existence, and (5) adjusts the environment as he receives information about pupil response, then one can legitimately wonder whether those concepts identified in (1) are likely to be learned as a function of teaching skill!

1. Popham, op. cit.

Hunt's framework for describing the processes by which teachers adapt to students contains two hypotheses which could be used to guide the training experiments:

1. That teachers' explicit matching of environments to children will be a function of:
   a. A repertoire of models of teaching.
   b. A repertoire of clinical skills appropriate to those models.
   c. Ability to conceptualize learning styles and discriminate among learning styles in children.

   Explicit matching manifests itself in preactive decision-making behavior and in follow-up of decision making (implementation of the selected environments).

2. That implicit matching (adaptation of environments during teaching) will be a function of competence in explicit matching. In other words, (a), (b), and (c) above will lead to responsiveness in interactive teaching.

   Implicit matching is manifested in interactive decision making--especially in perceiving learner responses and modulating behavior--and in exercising teaching skills so as to adjust the environment to the students.

## The Program of Research

The program of research is designed to clarify the organizational behavior of teachers and to suggest ways of improving it. An "improvement" in this sense is a skill that gives the teacher greater control over his behavior and the capacity to use his control to increase the learning of his students. In order to seek this kind of knowledge, the following steps might be followed.

First of all, a map of teachers' preactive and interactive decision-making behavior is needed. To develop this map the development of instruments that can be used to study teachers' decision-making behavior within each of the role settings is necessary. At the outset these instruments should not impose categories of decisions but should be broad enough to obtain information about the decisions teachers make so that they can be classified and the categories which result can be interrelated. We need to be tentative about accepting this information because most previous investigations that set out to determine whether teachers use behavioral objectives employed instruments in which the teachers were asked to state the objectives. Teachers may not respond to that direction, but they may, in fact, utilize objectives and may reveal that they do if more non-directive data-gathering techniques are employed.
respond to that direction, but they may, in fact, utilize objectives and may reveal that they do if more nondirective data-gathering techniques are employed.

It is particularly important that we obtain a map of teachers' interactive decision-making behavior since it has been neglected and because it is crucial if we are to understand the relationship between the organizational behavior of the teacher and his employment of skills during the act of teaching. Hence, initial investigations might attempt to provide a picture of the types of decisions that teachers make and the interrelationships among them. What, for example, are the natural "styles" of decision making?

Although it is not expected that relationships will be found between decision-making styles and student learning in the initial studies, an attempt could be made to identify any relationships that do exist and to

identify also the relationship between decision-making behavior and the types of transactions that occur between teachers and learners. If information of this sort is learned, it could say something about the ways that preactive decisions affect actions during teaching.

Once the decision-making behavior of the teachers in the three roles (facilitator, small-group leader, and presenter) has been described, one might engage in a series of studies to intervene in the teachers' decision-making processes and obtain information about how decision making responds to training. These studies could be generated from three sources.

First, teachers could be taught two "models of teaching"--patterns of teaching derived from different theoretical sources.[1] The purpose is to determine the effects of the acquisition of these models on the decision making of the teachers. It might be expected, for example, that as a teacher attempts to employ a given model of teaching the theory and patterns of the model will affect his decisions about objectives and means and about the employment of skills in the teaching situation. It is important to learn whether the decision-making processes of the teachers do, in fact, change in any important way when they employ different models of teaching or whether decision-making processes generalize across models, because it could help us learn whether effectiveness in decision making is likely to be specific to teaching approaches or more generic. Hence the studies with models of teaching as an intervention might use highly contrasting models to determine whether decision making behavior stays essentially the same or is changed as different models are employed.

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1. Joyce and Weil, op. cit.

Second, the behavior of the teachers could be compared to the paradigm for decision making. In other words, the extent to which the teachers appear to coordinate objectives, learner characteristics, and the selection, generation, and maintenance of environments might be determined. Discrepancies between normative teacher behavior and the paradigm could provide information about training directions.

Third, the processes of teacher decision making could be related to pupil learning in an effort to determine whether some of the patterns are more effective than others. If this turns out to be the case, then those more effective patterns of behavior become potential training objectives for interventions in the organizational domain.